

21•C

Cities: a date
with density

The Club of Rome:
godfathers to
the globe

Faking it:
the sexual
revolution of
information
technology

Education
Beyond the
Blackboard
Bungle

Barry Jones'
Flower Power

Superconductors:
a Fundamental
Break

**The
Simpsons**
New Values?

Laser-
Blasting
Cancers

Murder is
Natural

Technofear 2
McKenzie
Wark's
Sequel



SUPPORTING EDUCATION

MESSAGE FROM THE MINISTER FOR SCHOOL EDUCATION
AND YOUTH AFFAIRS NSW, VIRGINIA CHADWICK



21•C is a rich source of thought-provoking material.

The future economic and social well-being of Australia will depend on the capacity and ability of our young adults to balance the demands of growth and technology change on one hand with effective environmental management and conservation on the other.

21•C complements effective environmental education programmes which ensure that students will be equipped to participate in decisions determining the quality of their environment.

Students, teachers and parents will benefit from this forward-looking publication.

Virginia Chadwick



Telecom Australia

BUILDING THE FUTURE

MESSAGE FROM THE CHAIRMAN OF THE AUSTRALIAN
COMMISSION FOR THE FUTURE

We know – as many teachers know – just how good *21•C* is, and how valuable it is for classwork.

Now the Australian Commission for the Future, with the support of Telecom Australia and the New South Wales Minister for School Education and Youth Affairs, Virginia Chadwick, is able to place a free copy of this issue of *21•C* in every government school in New South Wales.

I hope you join our growing number of supporters.

Robyn Williams

Making Cents Out of Science

AUSTRALIA WILL SPEND MORE THAN \$3B on science and technology in 1992-93 with the Commonwealth government allocating \$2.8b of this total. This is a substantial outlay on what is described variously as "serendipitous", "reinventing the wheel", "driven by the interests of scientists rather than market needs". And when there is commercial opportunity too often the results are sold overseas at knock down prices.

Is it heartening to read that the European Community's investment in research and development has been reviewed in strikingly similar terms? The report of the Information and Communication Technologies Review Board critiques the major, broad ranging, collaborative research programme ESPRIT, the smaller RACE programme which has the central goal of developing a European broadband network, and DRIVE which is a much more focused programme directed at transport technologies.

The Information and Communication Technology (ICT) industries are set to become the largest economic sector in most industrialised economies. Despite this, in Europe in 1991 there was a balance of trade deficit in ICT industries of about \$40b, expected to rise to \$60b by 1996. The Community's balance of trade in ICT was neutral as recently as 1978. Europe has lost ground to major rivals Japan, who dominate the microelectronics and consumer electronics markets, and the U.S. who have strong market positions in microprocessors and computers. Pacific rim countries have emerged as new rivals taking leading market positions in focused sectors: Korea in consumer electronics, Singapore in peripherals, Taiwan in computers.

The European ICT research and development programmes have been funded since 1984, however the Review Board found little in terms of direct and measurable economic benefits to European industry. "One-third to a half of (ESPRIT) projects appear to have produced little of industrial value, and a higher proportion of project participations have been of little direct value to industrial partners."

Many of the successful scientific results have not been in core business areas, related to European industrial competence nor in sectors which are large on a global scale. Participation in collaborative research projects of large companies was criticised. R&D departments are not locked into product development departments and top management is often ignorant of the results. Furthermore ESPRIT's R&D collaboration was often outside the mainstream of their businesses – dissipating the energy and will required to take a scientific discovery to the market place.

The Review Board's recommendations are strikingly relevant to Australia. Our hefty \$2.8b per annum funding illustrates the importance we place in the contribution of scientific research and development to the future, but we have been unable to link scientific research and industrial, economic and social benefits.

The recommendations have an inescapable logic. One fundamental logic is that of "market pull" opposed to the more usual approach of "technology push". It is hard to disagree with the need for a *long-term* understanding of the market for information and communication technologies, and efficient and speedy trans-



Susan Oliver
Managing Director, The Australian
Commission for the Future.

fer of research results to industrial companies and end users. The Board recommends scrapping ESPRIT, RACE and DRIVE and replacing them with three radically different programmes much closer to the market.

The Board recommends market research of the needs of society for information and communication technologies on a global basis *and into the future* and highlights the need for long-term visionary objectives. After all, the time frame required for much research and development means that results will be delivered into that future society 10-20 years from now. The ability to know the shape and needs of that future society provides a strong competitive framework in which to align the endeavours of the scientific and

industrial communities. This is of course the very essence of Japanese industrial development. As the report of the Review Board states, "Japanese industry benefits from a long-term outlook, which is also accepted in financial markets".

From this long-term forecasting and research the Board recommends that no more than five well focused, market oriented research areas be selected. The reasoning is to address developing market needs, particularly those aligned with the European Community's objectives in social cohesion and equity but which provide industry opportunities in international markets. The objective would be market dominance in the chosen markets.

The new emphasis of the funding support is on *transfer* of technology to European companies – not on developing more scientific and technological know-how.

A rule of thumb of the proportion of funding and effort required to bring a technological discovery to the market place is the product development and marketing to scientific research ratio of 10:1. Australia could well be spending \$28b on technology commercialisation. But we are not. Generously speaking about \$500m of the current Commonwealth spending of \$2.8b could be seen as attempts to commercialise science. But with what knowledge of current and future markets? With what long-term visionary objectives for Australia's place in the world of the future? With what alignment with our industrial, economic, educational and social purposes and efforts? Certainly none I'm aware of.

I believe it's fair to say that Australia has the absence of a science and technology strategy – instead there is an *ad hoc* science and technology approach which owes much to serendipity and about which there is considerable room for concern.

The European Review Board recommends three major new programmes, one of which has the sole objective of transfer of technological know-how into small and medium-sized enterprises. Such enterprises are of fundamental importance in achieving employment and equity among members of the European Community.

It also recommends that collaborative research projects be structured so that collaborators are not competitors but provide complementary activities to take technology or products to the market place. This model ensures a nation has access to all parts of the commercialisation process and benefits have a better chance of staying on-shore. Those commercial activities that

can't be found on-shore can be included as international collaborators or joint venture partners.

Thus the Board's recommendations amount to a logical, yet strategically potent reorganisation of the way scientific R&D can be connected to national economic, industrial and social endeavours. With these recommendations in mind, Australia needs to recast its national science and technology policy, the key components of which should be:

- Research of long-term trends and opportunities for Australia and its role internationally. From this, development of long-term visionary objectives for Australia's research, social and economic development. This is a research role the Australian Commission for the Future is well placed to undertake.
- From this, selection of a small number of developing and future market needs to provide the measurable objectives for research programmes committed to their achievement. Areas would be selected which reflect Australia's industrial competence, which are or can become core business areas of the participating companies and which represent market sectors with potential to be large on a global scale.
- Redesign of the current collaborative research model to create one which captures firms representing all value-adding activities in the commercialisation chain; thus better ensuring a commercial outcome and shoring up the risk of the benefits flowing off-shore.
- A considerable increase in funding for transfer to Australian industry of scientific and technological know-how including making finance available to the companies for its take up.

It is interesting how central the role of the Australian Commission for the Future is to connecting Australia's science with Australia's future. Yet typically Australia funds the nodes on the chain, it doesn't fund the connections between the nodes, between the scientific know-how and its application in industry, between the scientific know-how and its strategic relevance to the future Australia wants.

The Commission has now positioned itself with methods, skills and data to support governments and public and private sector organisations to better understand the forces shaping the future, and to define their strategic position within that set of possible futures. It is the responsibility of the Commission to apply these skills and capabilities to achieve the best possible outcome for Australia. The starting point should be a national science and technology strategy that really works.

Amongst current work undertaken by the Commission in these and related fields are:

Slag and Fly Ash in the cement industry.

Australian companies will face increasing environmental pressure on their operations over the next decade. The smart companies are recognising that these pressures may often be used to gain a strategic advantage over their competitors.

In the cement industry, some Australian companies are strategically positioning themselves by ensuring access to several industrial by-products which can be used with pure Portland cement to provide a cost-effective cement which also has significant technical advantages for some applications.

Two major industrial by-products previously consigned to industrial dumps and which are now used in cements in Aust-

ralia are ground granulated blast furnace slag and fly ash from coal-fired power stations. A study undertaken by the Commission recently identified that 8 million tonnes of fly ash are produced per year by Australia's black coal-fired power stations, and 2 million tonnes of blast furnace slag. This compares with production of around 6 million tonnes of Portland cement.

With rising concern about the Greenhouse emissions and potential increases in energy costs, coupled with growing understanding of how to use the technical advantages of slag and fly ash blended cements, use of these two industrial by-products seems set to increase.

The Future for Retirement Villages.

Australia, along with most industrialised countries has an ageing population. The weight of demographics suggests a bright future for retirement villages, but it is a future the industry finds difficult to imagine as it feels the impact of the property market slump.

The forces influencing the future of the retirement villages industry are of course a lot more complex than simple demographics, as the Commission's recent study for the Retirement Villages Association of Victoria demonstrated.

While the industry will need to target its services to the people of 75 years and older in the next 10 years, it will be the "young old", the people 65 to 74 years of age who will shape the consumption patterns of the first decade of the 21st century. This group, the first wave of the baby boomers reaching retirement have different expectations of their older years and are looking forward to very active participation in a wide range of sporting

and cultural activities. Just one of the recommendations of the study by the Commission is that the name retirement villages will have low acceptance among a group who are moving into their 'third age' where new careers could more easily be the norm.

What do aerospace and culture have in common?

Australia's cultural activities contribute \$14b to our national economy, as well as providing 200,000 jobs. Government funding at state and federal levels injects \$2b annually, however concerns have been expressed as to the extent to which potentially viable enterprises have been given the best possible support to reach their market place.

A study by the Commission for the Department of Arts, Sport, Environment and Territories has applied to the cultural industry the same strategic principles as would be applied to the aerospace industry, the metal fasteners business or indeed the commercialisation of science and technology. The results enable Government to take deliberate actions to connect cultural activities to their market places to improve the opportunities to achieve a dynamic and viable cultural sector.

A 20 year planning horizon.

The opera house of the future, where next in the world of metal fasteners, primary education: touching the future. The Australian Commission for the Future is increasingly active in supporting futures research and strategies for Australian organisations.

SUSAN OLIVER
Managing Director

21•C Subscription Takeover

From this edition, the Australian Commission for the Future takes over subscription management from the Australian Government Publishing Service (AGPS). Our aim is to achieve closer contact with our subscribers. We are already introducing a more personalised service. The recent reader survey was just a start. Any queries you might have about your subscription – or in making a Christmas gift to a friend or relative – should be directed to Lois Buxton, quoting your ID number. Also, complete sets of back issues are still available at half price, or a third-off for single back issues. We are continuing to offer our discount, subscription offer on 21•C for all new and renewing subscribers of five issues for the price of four. We are planning an exciting year and hope that you can join in our exploration of the future.

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LETTERS

Dear Editor,

I am writing in response to a short article (*21•C*, Spring, 1992) entitled 'And God Created Biology Students'.

Barry Price's conclusions to his survey trouble me. Are Christian fundamentalists among biology students really like a "viral infection"? Is such a world-view "anti-scientific" or is it an alternative world-view that is built on different presuppositions?

I think this survey and conclusions reflect his own bias. The Creation vs. Evolution debate is old news. He could have presented his results another way. For example, "A recent survey showed that 53.6% of first year biology students in Australian universities have a religious perspective of the world".

In my view, Christian theology and religious experience can only enhance scientific and economic development by giving an ethical and motivational foundation, and more importantly, by giving it a reason for "being".

REV. PHIL MARSHALL

Dear Editor,

As a longtime follower of the Science Show and subscriber to *21•C*, I have decided to write to you complaining about the article in the Winter 1992 issue on The Earth Summit. As a professional ecologist (now retired) who has been involved for some years in international and Australian scientific conservation organisations, I find the article wishy-washy - it makes me wonder if it is pandering to "intellectual suppression" in Australia.

Of course, it was "a question of [lack of] courage", political expediency, and domination of "business and industry interests", at least in the U.S. in an election year, which destroyed the feeble chances of success of the Rio Summit. I despair if the tone of this article characterises Australia's self-acceptance, national identity, and "clever country" role in the next millennium. I have never liked the unreal and pretentious clever country cliché anyway - and much prefer "confident country" as a goal.

Jonathon Porritt (of Friends of the Earth, U.K.) attended the NGO Forum at the same time/place as the official Rio Summit, and did not mince his words in the two ABC broadcasts heard at the time. Since then I have not seen any satisfactory and accessible report of the Forum in the Australian media or elsewhere. It makes me wonder whether the forward-looking and futuristic *21•C* magazine should not have done more to shoulder this responsibility.

There is gathering evidence that international organisations such UNCED, IUCN,

etc. as well as the futile festive occasions such as the Rio Summit, are no longer competent, trustworthy or sincere reflections of the scientific, conservation and other non-bureaucratic communities. If *21•C* is to point the way to ecologically sustainable survival of life on Earth, let alone economically sustainable development, may I express the hope that you do not duck the responsibilities which you profess and that you will give us a good, solid, and courageous analysis of what is really going on at functions such as the Rio Summit.

Looking forward to some hard-hitting and if necessary, investigative scientific journalism in future issues.

L. J. WEBB
(Honorary Professor)

Dear Editor,

Congratulations on your latest issue of the magazine. I have read it cover to cover. Loved the Cyber stuff! The issues are getting better and better.

I would like to read some analytical stuff on the 'new' metaphysics and some of the holistic stuff that is permeating the Australian lifestyle. The 'spirit' of *21•C* is beginning to develop on the page and the magazine has the potential to play a neo-radical role in the shaping of this country and the Asia Pacific region over the next eight years. Accessibility/cost factor is your next big level to focus on.

EUGENE

Dear Editor

I would like to comment on the excellent article which appeared in the Winter edition of *21•C*, 'The Great Divide'.

We accept that change is inevitable, but when economic considerations take us from 2% youth unemployment in 1960 to a figure today of 40% and still rising, it's time the economic rationalists were taken out of the decision making process in this country. The future path of our nation should be plotted by people who can consider the result of their decisions from a social point of view.

Things like the growing crime rate here in Australia are the symptoms of an unjust society. The basic right of people today is to be able to earn their own living and once we move away from this basic need we are just inviting a decline in the social structure.

DENNIS MARTIN
Gladstone Employment Lobby Group

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Letters to the Editor should be addressed to The Editor, *21•C*, PO Box 115 Carlton South 3053. Due to limitations of space, letters over 250 words will be edited.

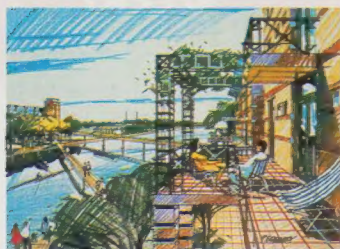
Australia's NEW WORLD CITY

All Set To Go

Work on MFP Australia's core site at Gillman, 15 kilometres north-west of Adelaide's city centre, will start early in 1993, provided the project's draft Environmental Impact Statement (EIS) is accepted.

Principal site works involving stormwater ponds and lake construction for the first stage of the new model urban development are planned for 1993-94 followed by a start on construction of the first village in 1994-95.

Already, water management and greening projects have begun.



MFP will offer a range of housing, from detached dwellings to waterfront apartments.

The major MFP core site at Gillman/Dry Creek is almost entirely Government owned. The land represents a vast commitment by the South Australian Government to the project and will enable the newly formed MFP Development Corporation to attract development to the MFP project.

The MFP is expected to attract a population of 40,000 - 50,000 people over the next 20 to 25 years with the first residents and commercial users taking up accommodation in 1995.

Put simply, the MFP component at Gillman will show Australians and the world how new and innovative styles of urban design and international business ventures can go hand-in-hand. The project will be a test-bed for new ideas and a model for new industries, environmental management and urban lifestyles. In the six years since the original proposal for a Multi Function Polis (MFP) was first raised in Australia-Japan Ministerial discussions, MFP Australia has been the subject of more books, and perhaps more media comment than any other major project in Australia's history.

Despite this long period of intense scrutiny, a good deal of confusion still persists about what the MFP really is.

The definition adopted by the Australian business community described it as "A world competitive infrastructure platform for the growth industries of the 21st Century".

MFP Australia will link nations, particularly within the Asia-Pacific region, in science and technology, education and the arts, culture and leisure. MFP will create wealth and jobs while preserving, instead of damaging, our fragile environment. Wealth and jobs will come through the pursuit of national and international investment in the three undisputed growth industries of the next century - Information Technology and Telecommunications, Environmental Management, and Education and Training.



The urban design concept will consist of a mosaic of villages separated by forests, lakes and open fields

These industries are expected to become dominant worldwide in the 21st Century and form the foundation that will underpin most aspects of our lives in the years ahead.

Australia's information services industry is already a fully fledged sector of the national economy - a \$22 billion a year business that is still growing at a rapid rate.

Education and training has become a multimillion dollar industry, one of the fastest growing in the world. Skills training alone is expected to grow at least 20 percent per annum over the next few years, achieving a global market size of \$20 billion.

The market for environmental management services is already staggering. By the year 2000 it will have grown to exceed \$420 billion worldwide.

These are not the only business development opportunities, but they do open the way to many other areas which have also been examined. These include health research, the space industry, transport, tourism and leisure, media and entertainment, agriculture and food processing, aquaculture, and technology based industries.

It has been the key objective of the MFP Australia project team to identify the national and international business opportunities associated with this 20-30 year "hightech" new city.

Adelaide is likely to be the hub of many projects to be undertaken throughout Australia as part of the MFP process. It will have the participation of many institutions, companies and organisations, and will ultimately link Australian centres with many other cities of the world. Australia's largest company - BHP - has already indicated its intention to participate in the MFP which is offering specific business opportunities to major Australian organisations and conducting an investment attraction program through Europe, Asia and North America.

The injection of \$40 million into the MFP by the Federal Government in March 1992 - a positive signal for investors - was followed in April by the South Australian Parliament's passing of key legislation to establish the MFP Development Corporation. The new corporation is responsible for the marketing, planning, management and operation of MFP Australia.



The MFP core site on LeFevre Peninsula at Gillman and Dry Creek comprises 1840 hectares approximately 15km from the centre of Adelaide.

The Goals



People

Helping to achieve the kind of society Australians want for the 21st Century - a society that is prosperous, skilled, international in outlook, sustainable and socially just.



Technology

Ensuring Australia's successful participation in the new growth industries that will be dominant in the 21st Century.



Environment

Linking the natural, social and economic aspects of the environment in new ways and by using new technology and skills to serve the community.

PEOPLE ASK...

WHAT IS THE MFP ? HAS IT STARTED ?



Is it an international project, a national project, a South Australian project or is it an urban development at Gillman in the north-west suburbs of metropolitan Adelaide?

Is it about creating new jobs, improving our economy and generating wealth for Australia by targeting the emerging high-tech industries that will provide all these benefits?

Is it looking at the social issues, what society needs and wants and examining new ways to plan our cities and suburbs to improve living conditions and quality of life?

And what about the environment? Is it grasping the challenge to make sure that Australia progresses both economically and socially in a sustainable way? Is it tackling the need for us to respect the fragility of our environment when we make development decisions?

The answer is Yes to all of the questions.

MFP Australia is a unique project which is breaking new ground and challenging traditional concepts - and it is asking the public, business and governments to question current ideas and have an open mind to new and potentially much better ones.

From the start, it has strived to combine the three important areas of people, technology and the environment instead of tackling each individually - to show how it is possible and indeed beneficial to link together the important aims of moving forward with new technologies, improving living conditions and protecting our natural resources.

To achieve these aims, the MFP project is developing two major intertwining elements: a physical development which will showcase new urban solutions and new technologies and be a

site for businesses, research centres etc to cluster; and a nationwide network of advanced technology industries, research and education centres.

The initial concentration for the network of high-tech industries is in three emerging high-tech areas which have the potential to create thousands of jobs and generate billion-dollar export opportunities: education training services, communications technology and environmental management.

The potential to develop the degraded land at Gillman was one of the reasons why South Australia won the bid to be the focus for the network and to be the location for the urban development.

This tract of land, next to a river estuary and a mangrove forest, presents a major environmental challenge and will be the nucleus of an environmental management industry.

Many major studies of the land have been undertaken, the Environmental Impact Statement is about to be released and work is expected to begin on the site next year.

New and fledgling industries will come to the fore to meet the far-reaching and innovative demands and conditions placed on those who will develop and establish at the Gillman site.

Several projects are well advanced, drawing on the activities of existing centres of excellence in Technology Park and Science Park and in the academic and research institutions in and around Adelaide.

MFP Australia has undergone a long gestation period. The stage is now set for the emergence of MFP as a major national project with substantial international participation.

Leading Australians Appointed to steer MFP

A group of eminent Australians will steer the development of the MFP.

The Premier of South Australia, Lynn Arnold, and the Federal Minister for Industry, Technology and Commerce, Senator John Button, recently announced that Mr Alex Morokoff AO would become the Inaugural chair of the MFP Development Corporation.

Mr Morokoff is a senior and widely-regarded Australian business leader. He is deputy chairman of Lend Lease Corporation Ltd and AOTC, and will bring to the position a wealth of experience in urban development, telecommunications and information technology. He will head a board of prominent Australians with wide-ranging experience in industry, research, education, government, environmental management and the community.

Senator Button and Mr Arnold welcomed the membership of the board as "a landmark in making the project a national and international success".

"The selection of such a strong board is a major step in demonstrating that the MFP is a viable project which will make a significant contribution to economic development in Australia," they said.

The board comprises:

- Mr Morokoff
- Mr Ross Adler, Managing Director of Santos
- Mr Will Bailey AO, Deputy Chairman of Coles Myer Ltd and former ANZ Chief Executive
- Ms Helen Disney, Director of Education and Community Services, Adelaide Central Mission
- Sir Llew Edwards, former Deputy Premier of Queensland
- Professor Mal Logan, Vice-Chancellor of Monash University
- Mr Richard Longes, Director of Lend Lease Corporation Ltd
- Mr David Plumridge, President, Local Government Association of SA
- Ms Kaye Schofield, Chief Executive Officer, SA Department of Employment and Technical and Further Education.
- Dr John Stocker, Chief Executive CSIRO
- Mr Robert Trenberth, Deputy Secretary, Commonwealth Department of Industry, Technology and Commerce.

For further information on the MFP Australia Project contact:
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Education is the lynchpin of the future. The generation at school today will be the leaders or the jobless of tomorrow. If they are not equipped for either role the results could be tragic.

In this edition of *21•C* we explore the current structure of Australia's education system and the changes that must inevitably come.

According to Hedley Beare, an educational specialist at Melbourne University, the entire structure of our educational processes must be reconsidered. It is not just the picture, but the very framework which must be overhauled, he says. Education must prepare younger generations for a world which will be buffeted by massive change, ranging from the growth of information technologies and artificial intelligence, through to issues of environment and urban structure.



After studying the rise and fall of ancient cities anthropologist Roland Fletcher has the formula for predicting those of the future. Robyn Williams discusses the possible direction Australian cities could take to avoid the chaotic urban sprawl of Los Angeles.

Of course the future of society depends very much upon the current leadership. McKenzie Wark ponders the significance of a U.S. presidential campaign attacking the *The Waltons* and *The Simpsons*. When President George Bush and cartoon anti-hero Bart Simpson get into a slanging match, what hope is there for reality?

The structure and machinations of power are also considered in Peter Moll's analysis of the Club of Rome. This mysterious organisation of powerful figures has alternately been considered insidious and invaluable. Moll, who has written the authoritative text on this shadowy organisation, updates the Club's status and environmental activities in the '90s.

In this edition we also explore the world of artificial intelligence. Wilson da Silva looks at Australian research in the field and finds that Australian ingenuity is helping build some non-organic brain power that will change the processing of information – and perhaps the way that humans consider their own thought systems. We meet the head of Australia's Artificial Intelligence Institute, Michael Georgeff, and discuss their work with NASA and CUB along with the broader moral ramifications of AI. Meanwhile, Alistair Mant ponders whether humans can work with the systems they build.

Similar technological impact will affect two of the oldest transactions known to humankind – sex and money. *21•C* explores how advertising will cope with the new media and how pornography running down fibre-optic cables will be censored.

In all, it is an issue that considers how we are taught, and whether that knowledge will cope with the amassed changes that technology is placing within our 'hearths and minds'.

The last edition of *21•C* went to Singapore and with this issue we expand into New Zealand. Next year we plan to encircle the Pacific rim!

ASHLEY CRAWFORD Editor

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Technofear

With bigger budgets and twice the technofear fun, humans are being overcome by the engines of their own creation. What anxieties lurk in the shadows of the new 'tech noir'?

By McKenzie Wark

They're back!!! The same unlovable, unspeakable fears that made you quiver and squirm in *Terminator* and *Aliens* returned for last summer's cinema season, brandishing bigger budgets and all new special effects. *Terminator 2* and *Alien*³ played out two of the principal fears lurking in the psyche of postmodern culture: fear of technology gone out of control and fear of a vengeful nature gone out of control....

While the budgets were bigger than ever, the ideas in these films were pretty much the same size. Both are *tech noir* movies. This is a film genre which on the surface appears to mix up some ideas from the old *film noir* gangster movies of the '40s with science fiction settings and props. While neither *Terminator 2* nor *Alien*³ add all that much to popular cinema, they do illustrate some curious things about the way technology and the future figure in popular culture.

For example, even the most hip, up to date film hit of the season is likely to miss if it doesn't manage to marry something old to something new, not to mention something borrowed, something blue and something down-right sexy. *Terminator 2* comes fully accessorised with the latest special effects, but it also borrows from Shakespeare's *Othello*. The film opens with the arrival in the present of two terminators, one good, one bad. Arnold Schwarzenegger appears first, only this time he isn't the bad guy. Even so, his first move is to acquire the outfit of a bike outlaw. The bad terminator, on the other hand, quickly becomes indistinguishable from the local law enforcement officers. He plays Iago to



Arnie's Othello. As with the play, all is not what it seems, and as the action unfolds, false appearances are stripped away. Thus does the cinema crank on into the future: by recycling and recombining the elements of the past with the elements of the present; special effects with durable stories.

And what special effects! Industrial Light and Magic created the remarkable liquid metal terminator effects using Alias/2 software developed by the Canadian firm Alias Research Inc. Most computer modelling software uses polygonal mathematics. The images are basically a set of geometrical shapes that are varied in size, shape and position. Alias software uses spline mathematics which more easily calculates complex curves. It gives the shapes it creates a very fluid look. The bad terminator comes across as the ultimate technology horror – infinitely malleable but always malicious.

Where the terminator became more protean, the alien became a lot less shapeless, which is perhaps why *Alien³* was such an unsatisfying movie. It looked too much like a puppet or a man in a monster

shoot-out in Main street was to the western. In both cases, the setting for the big gun-down represents the death of the past. Westerns were about the passing of a rural America based on the values of agricultural communities and the inevitable coming of industrialisation. *Tech noir* films are about the end of that industrial culture and the coming of something unknown. Both the terminator and the alien die screaming in red-hot crucibles of formless metal, out of which the future will emerge – as soon as we know how to mould it. Before we can do that, however, there are ghosts that have to be laid to rest: the technofear of being overcome by our own machines; the fear of a wild nature that can't be controlled or killed.

In *Alien³*, the alien has to be persuaded to run through a maze of industrial style metal tunnels so that it can be trapped in the crucible and destroyed with a shower of molten lead. The alien is not interested in anything but killing, eating and breeding, so the only way to persuade it is with live human bait. What are we to make of this repulsive, perverse creature and the desperate attempts of Sigourney



suit. What the producers of *Terminator 2* figured out ahead of the makers of *Alien³* is that special effects only work for a short while before they look dated and fake. Nowadays, this means a new software technology is needed every season to produce a new look and a new shape in the spectacle of evil. Movie making is now the research and development branch of top-of-the-line graphics.

Both the hyper-fluid terminator and the hyper-animated alien end up in a vat of molten metal at film's end. Ever since *Robocop*, decrepit old industrial buildings have been to *tech noir* films what the

Weaver to destroy it through three exhausting feature films? There are many things the alien might represent. Popular cinema that works is never about just one thing. It always gets its hooks into different people in different ways, because each of us has fears and desires that we want to hook up with imaginary stories. Stories like the *Alien* movies allow us to hook our troublesome unconscious lives onto stories that resolve crises in satisfying ways. As long as the economics of popular cinema demand big audiences, movies will have to tap into the frenzied tangle of our unconscious selves.

The alien might just be an image of that frenzied tangle lurking unacknowledged in us – a self of relentless drives, a self that knows no limits, no ethics, no reason, no compassion. For some people, this dark side of ourselves is the unconscious, for others it is evil, for others still it is the feminine. Thus *Alien*³ could be about the rational self channelling and containing the irrational, unconscious self. Or it could be about good triumphing over evil. Or it could be about representatives of 'normal' society wrestling and overpowering a monstrous, medusa-like female energy. All of these are plausible read-

from the droughts, famines and floods we see on the nightly TV news disaster-spot. Increasingly, we come to suspect that all of our efforts to wrestle nature to the ground with industrial technology has been in vain, and the rising temperatures, the sudden death of whole species, the hole in the ozone layer, are the signs that the ghost of dead nature may come back to haunt us.

This may seem far fetched to anyone who thinks of nature as a glossy wilderness poster of lush green rainforests – the very image of harmony and inscrutable order. Yes, there is such an image of it in

New software technology is needed every season to produce a new look and a new shape in the spectacle of evil. Movie making is now the R&D branch of top-of-the-line graphics.

ings of the film and all have been offered by critics at some point or other. The point about cinema is that it takes images that have a lot of different associations condensed in them and plays them out in such a way that hundreds of viewers can all sit together in the same cinema, all riding the roller-coaster of suspense and shocks together, but all hooked on their own individual versions of what is alien in our midst and what the powers are that can overcome it.

One interpretation of *Alien*³ which isn't mentioned much would view the alien as an image of nature. Like so many *tech noir* movies, including the previous two instalments of *Aliens*, *Alien*³ is about a confrontation between postmodern people with all their up-to-date technologies and raw, violent, unstoppable nature. The only difference is that while most of these films take about 60 minutes for the technologies to fail or run out, this one begins with the alien let loose on a prison planet which runs a decrepit old lead smelting works. *Alien* and *Aliens* involved a stripping away of technologies, so that Sigourney Weaver's character Ellen Ripley has to confront the alien armed mostly with her spirit of survival and a flame-thrower. In *Alien*³, the only available technology is old industrial era stuff, so Ripley and the gang of recalcitrant prisoners are thrown back onto human resources. Even the flame-thrower trick Ripley used in the previous movie fails.

The final confrontation is between humans and nature, but in a man-made world, an industrial wasteland. The film taps into a feeling that while, with sweat and blood and tears, human labour has remade the environment with cities and mines and roads and lead smelting works, nature has not been pacified or conquered. The ghost of nature, uprooted and paved over, comes back to haunt us. In *Alien*³, it is a monstrous thing, without culture or reason, a spirit of pure aggressive will to survive. It is the nature most of us know only

our culture, and we are encouraged every day to worship this good and bounteous thing. Yet lurking in our unconscious, there is a deep *ambivalence* about nature. We can't shake off the feeling that nature really isn't very nice to us. And we certainly know that we haven't been very nice to it. Whether it be guilt or fear, movies like *Alien*³ tap into this dark side of our relationship.

There is a ritual side to cinema. It is a communion in the dark with our other selves – with forces that we like to keep at a distance because we have ambivalent feelings about them. Our culture is ambivalent about the relationship between good and evil; men and women; nature and culture; humanity and technology. Popular cinema, particularly *tech noir* films, plays out these relationships of extremes, and they do it using characters who are intermediaries between the far side and 'us'. Crucial to these films are characters from the margins of Hollywood's stock of archetypes.

Ripley is the 'castrating bitch' character, who in *Alien*³ works with a gang of prisoners whose leader is a shaven headed, charismatic black man with heavy glasses. In *Terminator 2*, it is a teenage runaway and his survivalist nut mother who team up with a cyborg half human, half machine terminator to save the planet. These are characters who mediate between the 'normality' most cinema-goers imagine they represent and the other side – whatever they imagine the threatening great other side to be.

If it isn't nature, sometimes it's technology. If we are ambivalent about nature, we are down-right suspicious of technology. *Terminator 2* plays out this anxiety by pitting the good terminator, a T-800 model played by Schwarzenegger, against the bad terminator, a T-1000 model played most engagingly by computer effects. Technology has its uses, but it can go too far. Like nature, it too can be imagined as something protean, formless, unreasonable, relentless.

Like *Alien*³, *Terminator 2* is a relentless movie in which the bad object which condenses all our fears in its formless self is hunted into a crucible of molten metal.

In *Terminator 2* the fear may be that our struggle to control technology could be endless. Not for nothing is this a time travel story in which the future keeps coming back into the present to haunt us, much like archaic images of nature keep coming back in *Alien*³. The feeling that technology is basically good but has to be kept under control is close to the surface in *Terminator*, but it is not what is lurking in its lava-like depths. In Fritz Lang's classic cyborg movie *Metro-polis*, the nightmare story of technology-gone-mad ends with everything restored to balance and order. Labour and capital; feminine and masculine; intellect and strength; reason and emotion; technology and humanity – all are restored to their proper order at the end. Only the evil scientist and his robot must perish. But that was in 1926, before yet another great war, the bomb, Chernobyl, global warming. In the '90s, the idea of technology being basically good but with some tragic defect won't wash any more. Now it is something that is simply *there*, all around us. Now it is something that we must wrestle with *all the time*, for it gets out of control *all the time*. It is no longer something we love or hate. It's just something like the weather and phone bills, one just has to deal with it. Technology has an eternal return – it just keeps coming back and coming back, always different in what it does and how it goes wrong, but always coming back into our lives. It's like a video game where as soon as you have one level figured out, you're onto the next.

Both *Terminator 2* and *Alien*³ are remarkably like video games, with their endless chases through complex mazes and shoot-outs in confined spaces. Clearly their makers have twigged to the fact that their young audiences spend more time playing Nintendo games than watching movies. Movies now have to respond to expectations formed on video games, not vice-versa. One almost expects the screen to read 'game over' at the end. While the pace and visual style panders to up-to-date tastes, the stories themselves are post-

modern versions of very old fears. Fairy stories have always been about two kinds of danger: magical objects crafted by wizards that go astray; and creatures of the forest that are released from their natural domain.

These fairy stories are the raw material of mainstream cinema story-telling today. These two stories are recast as either a moral fable about the harm we do to ourselves by harming nature; or as moral fables about the harm we do to ourselves with the thoughtless

pursuit of techno-culture. In these latest instalments, both nature and technology have to be hunted back to the crucible and recast anew.

There is no clear 'message' in these films. Popular culture rarely works like that. There are only fears, anxieties, ambivalences; or desires, lusts, wants and needs. *Tech noir* films trade more on the fears and ambivalences than the desires, although Schwarzenegger's terminator does fulfil a desire for power or protection for young male viewers. They might desire to be him because he is powerful and suffers none of the humiliations that young males feel. They might desire to be protected by him, an image of an uncomplicated surrogate parent. Nevertheless, whether fear or desire is the key motivation, these films might motivate viewers in quite different directions. One can be thankful, at the end, that the

extreme powers of nature and technology have been wrestled to a standstill by the human spirit. Or one can be struck with an unspeakable awe for the sublime grandeur of the force of nature or the power of technology.

In this, mainstream cinema offers a valuable lesson to anyone who would be so bold as to speak in the name of what the public wants, what the dangers to our way of life are, or what kinds of futures are desirable. All our desires, all our fears, all our visions are things of profound ambivalence and bad faith.

Nothing is ever black and white. Our deepest feelings are always lurking in the flickering shadows. ●

McKenzie Wark lectures in communications at Macquarie University and writes for the Higher Education Supplement of *The Australian*. His last story for 21•C was on technology and the military-industrial complex.



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Special Defects

In science fiction cinema the gadgets of the future are often embarrassingly obsolete. PETER O. FRIES checks out the used-by date on a few famous flicks.

For me, science fiction has always been judged by my first cinematic experience of the genre – Stanley Kubrick's *2001: A Space Odyssey*. I remember the first time I saw the film in 1969 as a science-infected and telescope-toting teenager. On the 70 mm screen in a crowded cinema near Euclid, Ohio I marvelled at the use of technology like the now-available videophone, although the cost of the call in the movie – I think it was \$1.43 – was off by at least an order of magnitude.

The silence of space, the voice of HAL and the journey through infinity seemed more vital reality than virtual. It remains for the techno-tempted as the definitive mix of fact and imagination and a reminder that anything not forbidden is compulsory.

But the sign at the crossroads of science fiction and science faction these days has led some film-makers down a tainted Yellow Brick Road – to borrow a metaphor from the first bit of sci-fi to make it to colour television. The sign of late has read 'techno-fiction' and points to a suburban sprawl of recent tech-fi celluloid. The current round features box-office bonanzas like *Terminator II* – or *T2* if you are like, totally cool – and the Sig-infested *Alien³*, not to mention the politically correct *Batperson 2*. Now I'm not a film critic, but there are just a few too many breaches of basic engineering and science to let these movie magicians off the hook.

In the current flock of flicks the former leaps of scientific imagination have been replaced with a plethora of new and not-so-new dazzling technologies. Film directors and producers alike have used their scripts, cameras and megabuck budgets like steam-rollers over imaginations that are for many, science-flimsy. Gone are the likes of *Twilight Zone*, *Outer Limits* (WE control the vertical, WE control the horizontal). These days, the movies are packaged as "empty boxes" to

quote Robert Altman. Marketing people know how to sell the boxes. "You just have to shake them to know something is in there," says the maverick director. It's a lemming thing.

So just when you thought it was safe to defrost from suspended animation – or 'hypersleep' – there is *Aliens Cubed*, as it is written or *Alien³*, as it is described, depending on your mathematical interpretation. Cubed meaning perhaps that the flick is really nine times the thrill, I guess. Anyway, that's what you get when math illiterates do the titles.

The techno-fiction begins when Sigourney gets a jab of vitamins with, in the 24th or 25th century, a syringe of all things. If we have painless injections now, why would humans use syringes in 300 years of technical advancement? The reason, of course, is that watching a needle piercing an arm makes most of us a bit squeamish – which is what this movie is all about. There is also a CAT scan so I guess we can rest assured that

after it has been cut in two. The answer, of course, is to stick a probe in its ear and another in its skull and jump start it like a '63 V-dub. Robot Repair 101.

If you think bar codes would be gone by the 24th century, think again. The supermarket checkout is alive and well for processing future convicts. And just why did the *Alien* explode after a bucket of cold water was dumped on it? A noteworthy question for Dr Science.

As is, of course, the scene for any movie where the future is unlivable because, well, art directors don't need to build any new sets. Not surprisingly, it is the home of *T2*. *T2* was, in the words of Helen Meredith, editor of *The Australian's* 'Computers and High Technology' section, "a new classic in film history" and "the most powerful manifestation to date of how computer graphics can be pushed to the limit to give us seamless images on the screen". Which just goes to show what you can do given \$100 million

Joker Jack Nicholson captured it perfectly in *Batman I*, 'WHERE DOES HE GET THOSE FANTASTIC TOYS?'

at least some technologies won't go out of date in 200 years or so. Too bad we can't say the same thing about my lowly 286 lap-top which is already starting to petrify.

All in all there wasn't as much technology as in *Aliens I* and *II*. More of a 'Dungeons and Dragons' look and feel this time around. *Alien³* did have loads of technology that didn't work, much like an office in the former bureaucracy. There was also a chronic shortage of flashlight batteries but then again, there's never a charged battery when you need one in this century. There is even a lesson in the film for future robot technicians who may be faced eventually with the dilemma of making an android read computer files

and a host of Silicon Graphics workstations.

According to the computer guru, the likes of Industrial Light and Magic have provided a "happy marriage" (did you think it was an oxymoron?) of digital design and traditional cinematography. The critical element, according to Ms Meredith, is that the film allows the viewer to "suspend disbelief".

There's a marginal attempt to suspend belief in the revised *Star Trek* series, where people from stardate 2416 still tap on keyboards, although the 'holodeck' is a better extrapolation of virtual reality than the disappointing *Lawnmower Man*.

Speaking of *Star Trek*, why don't people get nauseous when the good ship *Enterprise*

chucks a U-y at warp 5? I wondered that very thought as I sat in the *real* captain's chair from the first series at an exhibit at the National Air and Space Museum in Washington D.C. and uttered those immortal words "all head warp factor 6, Mr Sulu". The Trekker technology from the series looked absolutely archaic and you begin to understand how the sorcery of movie making can transform cardboard and paint into good-guy "phasers" and bad-guy "disruptors". Suddenly the "beam me up, Scotty" communicator looked like a very cheap imitation portable phone and the tricorder a dusty reminder of the old '8 track' tape players. It puts the development of the compact disc and

a few too many 'bam-crunch-pow!' parallels between the seediness of Surfers and the streets of Gotham City. If the growth predictions are correct, we could wind up with the future equivalent of Gotham's Gold Coast. The movie was part of Movieworld's first birthday celebration. Before the flick we were informed that Movieworld is "the most successful attraction" in Australia with 1.2 million visitors last year. The Air and Space Museum in Washington D.C., by contrast, attracted over 8 million. Fact vs fiction.

In the latest from Warner, we see a whole range of 'fringe de la fringe' technology. Joker Jack Nicholson captured it perfectly in *Batman I* - "where does he get those fantastic

that he programs to knock off four, yes count them, four baddies with a single bat boomerang (batarang?). All of this while the four baddies wait for him to do the programming. The scene looks at bit like 'Dialling for Baddies'. And what do you think lurks underneath the bat cape beside those unbelievable toys? No, not the bat heart, which Catwoman tried to find. No, under the svelte cloak is a fully operational hang glider. Yeah right, pull the other one.

Penguin is into VR with the first (and probably last) batmobile simulator that remotely controls the batmobile. (The Penguin's gang somehow got full engineering drawings of the batmobile and figured out, in the space of one ten-second scene, how to reprogram it to run from the simulator). But here's the clinch. When Batman is in deep do-do and about to write off the batmobile, he punches a hole in the floor of the otherwise impenetrable batmobile, reaches underneath and disconnects the hijack device.

The batmobile is also wired for sound - just your average CD to play while rolling around a city where journalists still take pictures with flash bulbs. What does Batman listen to? Well nothing, the CD is used to jam the controlling frequencies of the Penguin's simulator.

On the way out of Movie-

world, in a last bit of PR, the batmobile (yes, it's supposed to be from the first flick) was idling at the gate with a very imposterish Batman standing in the front seat and trying to look, well... batlike. "Thank god for CDs" I said to the caped crusader. True to form, the Knight of Nites didn't move - no Bat giggles, not even a Bat smirk.

I can't wait to see "T12" but I can wait to see, god forbid, "Batman Returns Yet Again". Just shakin' them boxes boss...

Looks like its time for ET to phone home. Pass me my shoe phone will ya Max? ●

Peter O. Fries is a regular columnist for 21•C and contributor to The Australian newspaper.



Michael Keaton, Kim Basinger and the Batmobile.

even the personal computer in a very interesting historical spotlight.

Had you forgotten about the "agoniser"? It's a small device used to inflict pain from the more confounding episodes involving "mirror universes". How about the "ahn-woon"? No, it's not a Klingon sneeze but a multipurpose Vulcan garrotte-type weapon consisting of a leather band about two metres long with handles at the ends. Forgotten huh? And you call yourself a Trekker. Tsk Tsk. Time for another mind meld.

Almost ironically, I saw *Batman Returns*, at Movieworld on Queensland's more-than-slightly tarnished Gold Coast. There were just

Toys?". Incidentally, this is a film where the marketing budget is almost twice the film production budget.

For all his macho failures, at least James Bond had Q to display and explain new gadgetry with the perfunctory "Don't touch that!" warning to techno-phobe Bondy. Aside from the obvious flesh bits, that was half the fun of Bond movies - just how would James get out of that "little spot of trouble" using some bit of explosive dust concealed in his dandruff?

Our Gotham gladiator defeats the baddies in one scene by pulling out from under his cape, a small device with a video screen

The Gaijin Futurist

Jim Dator dreamt of becoming part
of Japan but the resulting culture
shock made him look to the future.

❖ BY RICK SLAUGHTER



Jim Dator once had an ambition. He had fallen in love with the culture and world of Japan. It was, he thought, to become his world. Inevitably it was an affair never to be fully consummated. "I learned to have a certain independence from culture which I guess many people never

acquire," Jim Dator admits, describing his early passion for Japan. "I don't feel in the slightest bound by convention because for six years the culture to which I so fervently desired to adhere wouldn't accept me no matter how I behaved."

Jim Dator travelled to Japan partly to discover why this small and war-beaten country had industrialised so much more rapidly than any other non-Western country of the time. He also came to understand the crucial relationship between values, technology, and society. "I learned that, no matter how hard I tried, or how 'Japanese' I thought I was, Japanese society is impossible to penetrate from the outside.

"If I did something thoroughly outrageous from a middle-class American point of view, the Japanese tolerated it, but considered me to be a *hen na gaijin* (strange foreigner, or outsider). If I did something thoroughly conventional from a middle-class American point of view, they also tolerated it but *still* considered me to be a *hen na gaijin*. No matter what I did, no matter how outrageous or conventional from my American point of view, the Japanese both tolerated it and rejected it! So when I came back to the US, I decided not to care what middle class America – or anyone else – thought about me. If it seemed right to me, I'd do it. If it seemed wrong (no matter how strongly my culture said it was right), I would resist it. And I found I could do so easily and without (as far as I can tell) any guilt."

Dator, amongst the best-known figures in the international futures community, established the first college course in futures studies at Virginia Technical College in the U.S. in 1967. Since '69 he has directed the Centre for Futures Studies at the University of Hawaii and acted as president of the World Futures Studies Federation (WFSF).

His work is influenced by some of the classical dilemmas about social organisations and, on the other hand, macro-theories of social change described by Spengler, Toynbee and Marx. Behavioural science, the trendy topic of the '50s, also governed

Dator's early interests, leading him "to wonder about the possibility of predicting and even guiding the future movement of aspects of all societies."

A further event followed Dator's visit to Japan and helped to precipitate his futures career: "An American friend of mine, John Randolph, who was Associated Press Far Eastern correspondent for many years, showed me the draft of an article he had written entitled *The Senior Partner*. Randolph took Spengler's theory which describes the 'stages' civilisations go through, showing that Japan and the West had gone through exactly the same stages, in exactly the same sequence, for almost exactly the same length of time. But, and this is what turned my world upside down, Randolph concluded that Japan went through those stages approximately 200 years *ahead* of the West. If he was correct, the West could see its future in the *present* of Japan.

"His argument sent me on my way as a futurist. I have remained fervently committed to studying ideas about the future of my society and of all other societies and cultures in the world."

In 1966 Dator returned to the U.S. having regretfully concluded that he could never become Japanese. He met up with a group of architects and artists teaching, as he was, at Virginia Polytechnic Institute. Members of the Archigram Group from England inspired him to consider questions of design, especially social system design.

"One of my friends, David Greene, read some stuff I was writing and said, 'Jim, you sound like Marshall McLuhan'. I said, 'Who?' because I'd never heard of McLuhan, or Buckminster Fuller, or any of the other people he said I sounded like." It was Greene who pointed Dator towards the World Future Society (WFS), recently formed in Washington.

"I also happened to run across one of Alvin Toffler's first pieces on the future in a magazine called *Horizons*. The article was titled, 'The Future as a Way of Life'. I immediately began teaching my classes at Virginia Tech with even more of a future orientation. Then, in 1967, I got the necessary university approvals to teach what may well be the first officially-approved, regularly-scheduled undergraduate university course on the future ever taught in the US.

Significantly, the WFSF is an early example of an organisation beginning globally, rather than nationally or locally. The WFSF had its origins in 1967, in Oslo, at a meeting of people from many different parts of the world. The next

CONTINUED ON PAGE 86



JIM DATOR

THE INTERIOR

MONITORING CONTEMPORARY DESIGN ART ENVIRONMENTAL ANTHROPOLOGY



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NEXT

NEWS AND TRENDS

Life Below Earth

The idea that life exists deep underground was first popularised in 1864 by Jules Verne in his best-selling story, *Journey to the Centre of the Earth*. His intrepid characters encountered strange creatures as they penetrated subterranean caverns.

Echoing the spirit of 19th century explorers and adventurers, Verne set the tone for the burgeoning science fiction of today, lacing his fanciful tales with scientific information and speculation.

However, the notion that life might exist far beneath the surface lost devotees when deep mines and oil drilling consistently showed that temperatures increased the closer one got to the Earth's core. Verne's characters would have fried before they got a kilometre down, and as for his underground creatures, there was no way biologists could conceive of their cells surviving these harsh conditions.

Now, however, a radical re-think may be forced on geologists and

biologists by a remarkable discovery announced by Associate Professor Lloyd Hamilton in Brisbane. Speaking at the Australian and New Zealand Advancement of Science congress in September of this year, Dr Hamilton, a geologist at the Queensland University of Technology, showed evidence of micro-organisms, such as bacteria and fungi, thriving at high temperatures and pressures down to at least a few kilometres' depth.

His pictures, reproduced here, may not, at first sight, seem Earth-shattering, but that is precisely what they may be.

The bacteria have survived the harshest possi-

ble conditions deep in the solid crust of the Earth and appear to have been agents in the formation of mineral-rich fluids which have forced their way through solid rock to the surface.

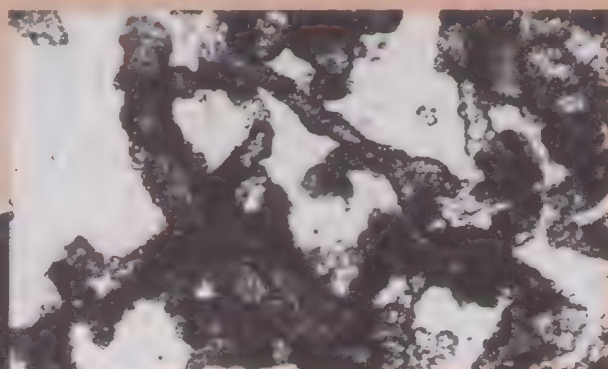
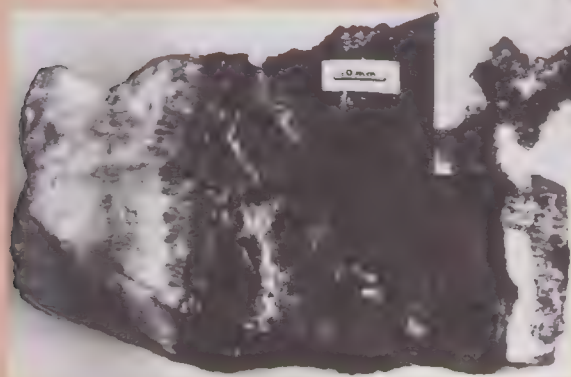
The intriguing possibilities emerging from this and other evidence are:

- life itself might have begun deep underground rather than on the Earth's surface [or beneath the ocean];
- many of the world's great mineral deposits may have an organic origin.
- life may exist deep under the surface of some planets.

In short, it opens up a new debate on the origin of life and, according to Dr Hamilton, a new frontier in mineral exploration.

Some years ago Dr Hamilton found the remains of "abyssal life" in veins of the mineral jasper near the Red Sea in Saudi Arabia. Under the microscope, the wispy filaments seemed typical of the residues of dead bacteria or fungi found in surface deposits, such as the ancient stromatolites on the coast of Western Australia.

But, to find them embedded in minerals which had been formed under great heat and deep



LEFT: CHUNK OF JASPER MINERAL ON WHICH BACTERIAL REMAINS WERE FOUND UNDER THE MICROSCOPE. ABOVE: REMAINS OF BACTERIA FROM DEEP UNDERGROUND. THE MICROGRAPH HAS BEEN ENLARGED 1,400 TIMES. TEN OF THE BACTERIA WOULD FIT THE WIDTH OF A HUMAN HAIR (ONE TENTH OF A MILLIMETRE). PHOTOGRAPHS © DR LLOYD HAMILTON.



► underground made the discovery so incredible that he held off publicising them until other studies had shown that life forms can exist at the high temperatures and pressures under which the jasper was formed.

Then, in 1983, bacteria were cultured from samples collected from volcanic vents deep in the Pacific Ocean. This showed that life can flourish

in sea water at temperatures as high as 250°C and pressures up to 265 atmospheres, the very conditions necessary for life to exist in the microscopic cracks present in solid rock beneath the Earth's surface.

Dr Hamilton's confidence in his discovery grew. "If I hadn't been working at London University with a biologist, Dr Marjorie Muir (now with

CRA Ltd), I would have missed the tell-tale signs of life," he said.

The veins of jasper are quite young, geologically speaking, as they cut across rocks which are from the Cainozoic period (60 million years ago up to the present) and others which are very old (Pre-Cambrian period – over 600 million years). These rocks exist side-by-side where the vast, young "Saudi plate" meets the even bigger and older "African plate".

Dr Hamilton says the veins are probably a few million years old and the depth at which the bacteria lived could be a kilometre or more.

Since his discovery in Saudi Arabia, he has also found remains of bacteria in the giant Macarthur River deposit of lead/zinc minerals in the Northern Territory. These minerals are Pre-Cambrian, opening up the possibility that bacteria played an important role in their formation.

Traces of organisms have also been found in the major iron ore deposits of the world. These deposits may well have been formed by biological, ►



ABOVE: DR LLOYD HAMILTON.
LEFT: THE VEIN OF JASPER MINERAL NEAR THE RED SEA WHERE THE DEEP LIFE FORMS WERE FOUND. PHOTOGRAPH © DR LLOYD HAMILTON.
BOTTOM OF COLUMN, FACING PAGE: VOLCANIC VENT ("SMOKER") IN A DEEP OCEAN TRENCH, WHERE LIFE EXISTS AT HIGH TEMPERATURES



AIDS drug in promising tests

Australia is the first country to grant a patent to a promising new anti-AIDS drug developed in the U.K. The patent has been granted while applications are pending in the U.K., Europe and the U.S.

Laboratory tests indicate the new drug could be 300 times more effective than AZT, the drug in common clinical use today. Importantly, the drug could have considerably fewer side effects than AZT and the more recent drug, DDC.

First information about the drug, code-named So221, was released at the British Association for the Advancement of Science meeting in Southampton in August.

"So" stands for Southampton University where it has been developed and "221" signifies it as the 221st compound in a series of novel chemical structures made by a group of chemists led by Dr Chris McGuigan.

Testing of So221's effectiveness and toxicity has been conducted independently, using standard cells in test tubes, by five laboratories in the U.K., Europe and the U.S. Preliminary tests,

using a standard virus in mice, have been conducted by one laboratory. More tests are planned.

So221 is based on AZT's molecular structure with one important difference. AZT, the most effective anti-viral drug developed to date, works by entering cells attacked by the AIDS-causing virus, HIV, and disrupts viral reproduction, preventing HIV from multiplying and spreading throughout the body.

However, while AZT works well in test tubes it is not as effective in living tissue. Further, AZT is toxic to both the AIDS virus and normal human cells, requiring an accurately monitored dose.

The drug cannot do its job completely whenever a particular enzyme is absent from the cell. When present, the enzyme attaches a phosphate group to the AZT, enabling the AZT molecule to fix onto the DNA chain being produced by the virus in the cell and prevent it from spreading.

Dr McGuigan's team attached a phosphate group to the AZT molecule to help it act more efficiently than AZT, once it has penetrated the membranes enclosing cells. Unlike AZT it does not require the enzyme to activate its attack on the virus.

However, the phosphate group carries an electric charge which inhibits its passage through the membrane of a cell. By "masking" the phosphate group with a variety of other groups, the Southampton team appears to have solved this problem.

So221 is able to enter cells in disguise, so to speak, and once there, the masking group is stripped off and the drug remains in place, stopping the virus from multiplying itself.

AZT is expensive to produce and, while synthesis of So221 takes one more chemical step than AZT, the yields of the reaction are "impressive", according to Dr McGuigan.

Even if So221 passes all stages of tests and clinical trials, he does not expect it will provide a complete protection against AIDS. Rather, he envisages it becoming one in a "cocktail" of drugs, including AZT.

While five years have already gone into the research project, Dr McGuigan stressed he could not predict how much longer it would take to bring the drug to the stage of clinical trials nor how much it would cost to produce. "We do not yet have here a cure for AIDS," he said.

Cold fusion revived

► rather than chemical processes, Dr Hamilton asserts.

"The micro-organisms have got in on the act first," he said. "But evidence of them is difficult to find as most mineral deposits have undergone massive metamorphosis (transformations by heat and pressure) which destroys their remains".

The suggestion that some minerals have an organic, rather than an inorganic origin, will spark debate among geologists.

A major problem with the theory that life began on the Earth's surface, Dr Hamilton points out, is that the environment in Pre-Cambrian times was exceedingly harsh. There was little to no oxygen and, without today's protective atmosphere, the surface was bombarded by fierce, life-destroying cosmic rays.

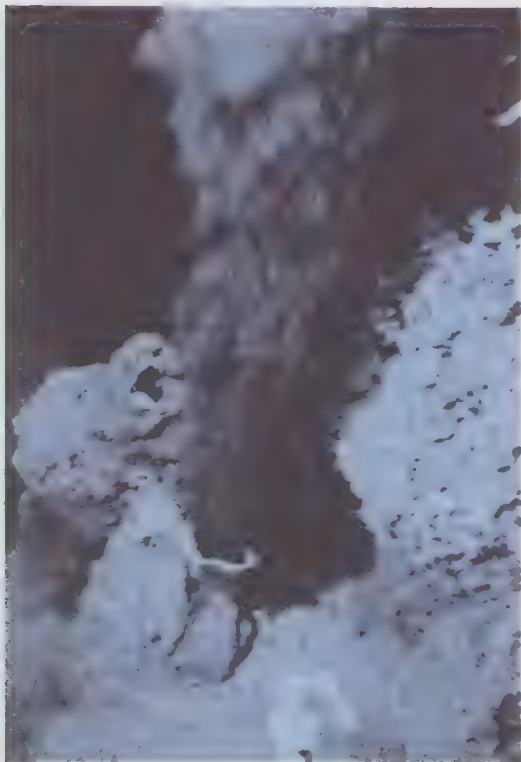
Dr Hamilton believes bacteria could have existed (and still exist) down to three kilometres, and, depending on how high a temperature they can tolerate, down to five kilometres. Water is necessary for life, but, in the case of these "anaerobic" bacteria, it can flourish without oxygen.

"The volume of life down there could be tremendous," he said.

If correct, this theory also allows that life could exist under the surface of some of the planets, such as Mars, a suggestion made earlier this year by the renowned British geologist, Dr Thomas Gold.

So, Jules Verne might have been on to something after all. The difference between science fiction and real research, though, is that the teeming life deep beneath our feet appears to be microscopic.

Yet, collectively, these countless billions of microbes may well have been extraordinarily powerful and, in the final analysis, crucial in creating the minerals on which our civilisation depends. ■



In 1989, Professors Martin Fleischmann and Stanley Pons stunned the scientific world and aimed massive publicity (and eventual notoriety) when they claimed they had used electrolysis to force atoms of deuterium, or heavy hydrogen, so close together in the crystal structure of palladium metal that they "fused" and gave out more heat than had been put into the system with the electric current.

Massive expenditure on fusion machines to mimic the Sun's processes on Earth have so far failed to produce the kind of sustained reaction needed for a useful source of energy.

The great hope of the fusion experimenters is that they can, in effect, make energy from the hydrogen or deuterium in water without the long-term radiation problems which have plagued the nuclear fission power plants now operating in many countries.

In August, at the British Association for the Advancement of Science meeting in Southampton, Professor Fleischmann said they are developing their discovery in France (at an "attractive" location he refused to disclose). He was speaking publicly for the first time since the original announcement was made.

Professor Fleischmann, a Briton, said the process he discovered with Professor Pons, an American, is not a scientific curiosity. They had repeated their original experiment "more than 100 times" and had obtained excess heat of one kilowatt per cubic centimetre, which he likened to the rate of a fast breeder nuclear reactor.

Many scientists have displayed intense scepticism that the pair have indeed generated nuclear fusion at near-room temperature.

Those groups which had tried to repeat their experiment, but failed, had not followed the necessary conditions or let it run long enough, Professor Fleischmann said.

"I see no reason for us to withdraw any of our statements," he asserted, though he conceded they had over-estimated the nuclear products of the combination of deuterium atoms.

"It is superficially an easy experiment to do, but in fact it is quite difficult to perform successfully. It takes about a week to initiate the process and you don't know exactly when it will initiate a spectacular release of energy and then you have about 15 minutes to observe it."

For the electrochemist, who has now retired from his teaching post at the University of Southampton, facing the press was the more searching of his two appearances at the conference. In his packed public lecture, apart from a video showing intense bubbling in a "cold fusion" cell, he pro-

vided little new information.

The temperature in the press conference went up several degrees when one of the media people present identified himself as Dr Frank Close, Fleischmann's severest critic and a senior nuclear physicist in the U.K.

In his book, *Too Hot To Handle*, Dr Close claims that cold fusion is a figment of the researchers' imagination and severely criticises the public presentation of the "discovery".

Professor Fleischmann countered: "The very high levels of heat generation have now been observed by quite a number of research groups for a limited time of less than an hour. If this can be maintained for long periods this will be a significant source of energy."

However, he would not provide anything more than general details of his experiments because "we are now working under commercial conditions". No evidence was supplied to indicate that cold fusion had been scaled up from the original test tubes.

His work is now supported by Technova, a "think-tank" with a lot of money being invested from Japan. "Hundreds are known to be working on cold fusion and tens of millions of pounds are being spent on the research," he claimed.

After the press conference and lecture, Dr Close said no new information had been presented to convince him that cold fusion is a reality: "The promise of cold fusion is always some years off, like the promise of the end of the recession".

Following the August meeting in Southampton, there has been a flurry of interest in Asian stockmarkets in 'cold fusion' as positive sounding reports filter out from research laboratories. In October, a researcher at the Nippon Telegraph and Telephone corporation, Dr Eichi Yamaguchi, reported having "detected particles resulting from cold fusion in five experiments". The nature of the particles was not specified.

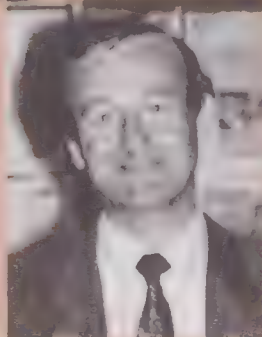
It is generally accepted by scientists that a true fusion reaction is accompanied by a release of neutron particles, helium atoms and the generation of excess heat. The detection of 'particles' has been reported by other experimenters but nobody has yet reported the hat-trick of all three effects simultaneously.

This has led the sceptics to assert that, whatever is happening in the test tubes of Fleischmann, Pons and their supporters, it is not fusion – or if any fusion is occurring, it is to such a small extent that there is little chance that any excess heat can be harnessed economically to solve the world's energy problems. ●

PROFESSOR MARTIN FLEISCHMANN



DR BRYAN CLOSE





Reef pools help coral death study

On a tiny island on the Great Barrier Reef, experiments have been taking place since October to determine whether the death of coral reefs is due to human-generated effluent or over-fishing – or whether a combination is to blame.

These unique experiments in micro-atolls, each the size of an Olympic swimming pool, are being co-ordinated by marine biologist, Associate Professor Tony Larkum, director of the One Tree Island Research Station run by the University of Sydney. The island is a pristine site lying 80 km off Gladstone, near the Heron Island resort and research station.

According to experts at the recent International Conference on Coral Reefs which Dr Larkum attended, reefs everywhere – but mainly those in the highly populated island nations of the western Pacific – are under severe threat of environmental extinction.

While researchers have long known that excessive nutrients in the water (notably nitrogen and phosphorus) and over-fishing make life virtually impossible for the super-sensitive coral organisms, it has not been possible to separate the effect of each factor.

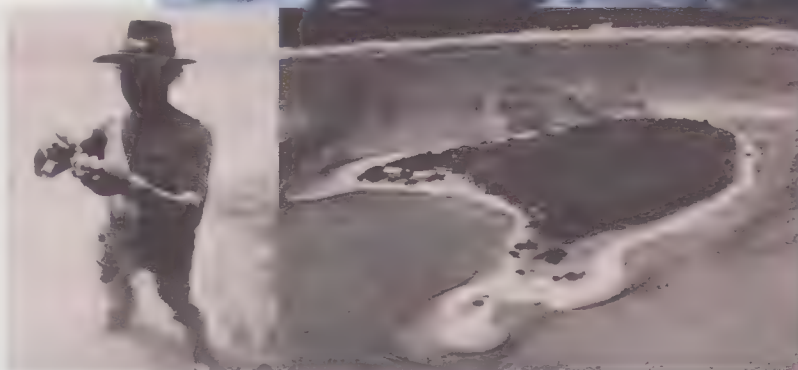
Farmers and urban developers have seized this scientific uncertainty to justify resisting controls on the effluent they cause in the open ocean.

In July, a report by Queensland researchers confirmed the general problem. The report revealed that each year 77,000 tonnes of nitrogen and 11,000 tonnes of phosphorus are being washed from land in Queensland into the waters of the Barrier Reef.

One Tree Island provides an ideal location for the two-year, \$300,000 program. Dr Larkum says that attempts to run similar experiments in Hawaii and Florida cannot match those on One Tree Island because of its unusual structure of micro-atolls spread over the island's coral reef.

As a result, researchers from Hawaii, Florida, U.K. and Israel are joining in the experiments with Australians from Sydney University, the Great Barrier Reef Marine Park Authority and the Australian Institute of Marine Science. Up to 20 scientists are involved in the project codenamed ENCORE – "Elevated Nutrients on Coral Reefs".

For six hours each tidal cycle, the low tide isolates water to a depth of one metre in the micro-atolls. Each is about 30 metres across, providing a set of comparable laboratories in real-life conditions without the complication of ever-flowing water and changing fish populations.



ABOVE: COLLECTING CORAL IN A MICRO ATOLL OFF ONE TREE ISLAND. LEFT: PROFESSOR TONY LARKUM SAMPLING WATER INSIDE A MICRO ATOLL ON ONE TREE ISLAND; ONE TREE ISLAND FROM THE AIR. (PHOTOGRAPHS: MALCOLM RICKETTS)

between added nutrients and over-fishing has never been measured.

Dr Larkum says that if one main culprit is identified, it will become possible, for the first time, for conservationists and planners

to tackle the problem more economically at its source, for example by treating sewage, regulating the use of fertilisers or controlling fishing.

The quantities of pollutants which affect algae and, in turn, coral on the reefs are extraordinarily small in comparison with those common in Sydney's waterways. The researchers will have to measure quantities of nitrogen and phosphorus 100 to 1,000 times less than found in the Hawkesbury River.

They will also be measuring how the enzyme levels in algae vary with the concentration of pollutants. Dr Larkum says a long-term hope is that these measurements will allow development of "biomonitors" which can act as early warning devices against threats to reefs.

The first few months of the study are being spent in studying the micro-atolls in their natural state to provide base-lines for artificially induced changes in water quality.

As for the effect of the expanded human population on the island, Dr Larkum says all waste, including chemically treated excrement, will be removed to the mainland regularly. Corals are so sensitive that even urinating in a micro-atoll can do sizeable damage. ■

Computers fail to save paper

Let those who boldly predict the future on the basis of technological 'trends' beware! Dr Tom Forester of Griffith University in Brisbane has shown that forecasts in the 1970s that computers would lead to 'paperless' offices were bunkum.

In a paper he presented to the ANZAAS Congress, he illustrated that computers have actually generated more paper than ever before.

"All the talk about future shocks, third waves, megatrends and post-industrial societies must now be taken with a very large dose of sodium chloride," Dr Forester said.

Despite the advent of computers, robots, word-processors and other so called labour-saving devices, working hours have not reduced. In the U.S., where a Senate committee had predicted that the working week would reduce to 22 hours and people would be able to retire at 38 because of the microchip, average workers spend a month per year longer at work than in 1969.

Dr Forester pointed out that the photocopier and the fax machine are the two most successful products to hit offices in recent years and these both use and generate vast quantities of paper.

[The paperless office will be the topic of a forthcoming *Apocalypse? No!* essay.]

Gently does it!

Professor Gordon Grigg (below) of the University of Queensland deftly handles an alligator in a night-time excursion. He is studying the ways in which fresh-water alligators and salt-water crocodiles survive in their environments.

Crocodiles have salt glands which act as personal desalination plants, enabling the animals to regulate their body fluids despite their intake of sodium chloride. Alligators don't have these glands.

Professor Grigg believes this shows that crocodiles evolved in a marine environment while alligators had no significant marine phase in their evolution. Nonetheless, he has studied some alligators in Brazil which live in salty water but are able to do so only because they can find fresh water for drinking.



Noble pursuits awarded

1 Physiology and Medicine

Every time we eat, move, grow, have a hormonal reaction or get sick, spare a thought for a biochemical reaction with the forbidding name of "reversible protein phosphorylation".

The discovery of this reaction, which explains how most of the biochemical processes of life are regulated, has been awarded the 1992 Nobel prize for physiology and medicine. The two American recipients, Dr Edmond Fischer and Dr Edwin Krebs, now in their seventies, are still very active researchers at the University of Washington in Seattle.

In a string of experiments beginning 40 years ago, they discovered a key step in the way proteins interact in the body, and cause many diseases. Their discoveries are now well known to every student of cell biology.

Proteins are the tools of the living organism. In a complex interplay, thousands of different proteins take part in the way cells live, grow, divide, change and die. For example, proteins convert sugars into muscular energy and initiate the release of hormones which control bodily functions.

Within each cell there is a cascade of chemical reactions which are turned on and off by the processes discovered by Fischer and Krebs. The "on" switch (or phosphorylation) activates a protein by adding a phosphate group (one phosphorus atom and four oxygen atoms) and changing its shape. The "off" switch de-activates a protein by removing the phosphate - hence the description "reversible".

The keys to the process are enzymes - small chemicals which act as catalysts in biological systems. Since Fischer and Krebs identified the crucial enzyme, there has been an avalanche of knowledge about the way cells work.

Dr Krebs echoed the prediction of the Nobel committee that drugs will now be developed to influence imbalances in such things as blood pressure, inflammation and brain signals by targeting specific proteins involved in phosphorylation.

Speaking on ABC Radio National's *Health Report*, Dr Krebs said: "We knew we had a new kind of process but we had no idea [back in the 1950s] that its importance was so widespread".

The development of molecular biology and genetic techniques in the last decade has led to "an explosion of knowledge", says Dr Krebs. But he modestly adds "it was a matter of luck" that he and Dr Fischer found something of general importance.

2 Physics

Fascination with the ultimate nature of matter led Dr George Charpak to design devices for detecting the most fleeting of sub-atomic particles. For his achievements, first published in 1968, he won the 1992 Nobel prize for physics.

Working with the giant accelerator at CERN, the



DR EDWIN G. KREBS



DR EDMOND H. FISCHER

European laboratory for particle physics which straddles the borders of Switzerland and France, Dr Charpak found a way of revealing the secrets of the innermost parts of matter.

Accelerators whip protons and electrons to very high speeds and then force them to collide. The result is a mini-fireball which spits out, in many directions, a blizzard of other particles, some of which only previously existed just after the "Big Bang" which created the universe.

The problem for experimenters is to record the particles and their interactions and to sort out only the most interesting. Earlier detectors, like the cloud chamber and the bubble chamber (which also scored Nobels for their inventors) depended on taking photographs of the tracks left by particles as they emerged from collisions.

But these became inadequate if only one "event" in a billion is being looked

for. Dr Charpak overcame the difficulty by designing a "multiwire proportional chamber" and using modern electronics to connect it directly to a computer which greatly increased the speed of collecting data.

The detector spots a speeding particle from the electric effect it has on a gas inside a chamber. From the tiny electric current generated, a network of wires senses the particle as it zips past and pinpoints its position. The detectors also have potential uses in low-radiation medical X-rays.

Dr Charpak's devices have had a profound influence on particle physics. Three important discoveries which earned other Nobel Prizes in physics - the "W" and "Z" particles and the "charm quark" - would not have been possible without it.

3 Chemistry

After years of research which conflicted with much prevailing chemistry, the work of Professor Rudolph Marcus has been vindicated by winning the 1992 Nobel prize.

Professor Marcus' research into the way electrons jump from one molecule to another in a solution describes "Cold light" wands (chemiluminescence), the fixation of light by green plants, the rusting or corrosion of metals and the conduction of electricity by some plastics.

According to the Nobel prize committee in chemistry, the practical consequences of the theory developed by Professor Marcus extend over all areas of chemistry. The transfer of electrons, minute charged particles, lies at the heart of all chemical reactions. From 1956 to 1965 Professor Marcus developed an explanation of how this occurs between two molecules, a process known as reduction/oxidation.

Energy has to be supplied for the transfer and the size of the "energy barrier" determines the speed of the reaction. Like any good theory it explained some puzzling observations in the laboratory and predicted others.



MURDER IS NATURAL

WILSON DA SILVA

Chimpanzees massacre chimpanzees. They commit genocide, conduct war, murder, adultery. Female Orang-utans are raped and gorillas kill their young. Humans are primates too, and recent genetic studies even tell us we are, for all intents and purposes, the world's third species of chimpanzee.



Wilson da Silva's last article for 21•C was on supercomputers.

It may not be politically correct or very popular, but what Professor Jared Diamond and a growing number of scientists around the world tell us is that, far from violence being an aberrant human trait, it is a natural impulse we share with many in the animal world.

"Murder goes a long way back," said Diamond, a renowned biologist and professor of physiology at the University of California. "Chimps practise it. The only difference is that we do it a lot more efficiently. The murderous impulses themselves, well they're something we inherit.

"The commonest cause of death of male adult gorillas is to get murdered by another male gorilla. One of the commonest causes of death for a baby gorilla is to get murdered by a male gorilla that has just killed the father of the baby," Diamond told 21•C.

Much of this thought has only recently started reaching beyond the rarefied world of academia, and Diamond is one of those leading the push. In his new book, *The Rise and Fall of the Third Chimpanzee*, he carefully dissects the essence of human customs and practices, and with countless examples from the animal world, cuts a swathe through sacred cows. Its frank and matter of fact style uncovers some uncomfortable facts about human nature, and has been hailed by some scientists as ground-breaking.

Diamond's book suggests that humans, with a thin 100,000-year veneer of civilisation cannot ignore seven million years of our primate past. In

fact, in many ways we have not evolved very far at all from the nasty traits of our distant, hairy evolutionary cousins.

Genetic testing for the difference between humans and the apes in the last few years has uncovered bombshells. There is only a 1.6 per cent sliver of difference between our genes and those of the two species of murderous and genocidal chimpanzees, despite humans and chimps parting their evolutionary ways some seven million years ago. Compared with gorillas, our genes diverge by only 2.3 per cent, says Diamond, who recently conducted a national tour organised by Sydney's Australian Museum.

This is a smaller difference than you would find between the willow warbler and the chaffinch warbler, two very similar European birds, Diamond says in his book. A visitor from outer space would conclude that humans are a slightly different form of chimpanzee – hence the name of the book which won this year's Rhone Poulenc Science Book of the Year award in Britain.

Like Desmond Morris and his bestseller of the 1960s, *The Naked Ape*, the 54 year old Diamond studies humans as animals in order to gain insights which our culture and human 'common-sense' blinkers obscure.

"What he's done with his book is pull together an overview of humanity, warts and all, relying on the huge advances of the last five years," said Dr Tim Flannery, the Australian Museum's senior research biologist, who was full of praise for the book and its author.

Diamond's detailed but very readable tome says war, rape, infanticide, racism and genocide are all parts of our past that were practised often.

"Rape is common in orang-utans and ducks. Groups of male ducks gang-rape a female, often injuring the female in the process. Among orang-utans, sex is either consensual or rape sex," Diamond said.

In mammals, the bigger the male compared with the female, the more polygamous he is, whereas if both are the same size, monogamy rules. The slightly

JARED DIAMOND



You can say war is in our genes. But like murder, rape and infanticide, it's something society can choose to suppress. In traditional societies, murder is widespread. But in the 20th century, despite two world wars, far fewer people have died violent deaths than regularly as a result of murder in traditional societies.

FIRST WE HAVE TO
IMAGINE A BETTER FUTURE, THEN WE
CAN BUILD TOWARDS IT

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larger frame and body muscle of men compared with women suggests humans are largely monogamous... but have a tendency toward extramarital sex, the book says.

Parentage studies of babies in Britain and the United States back this up – a surprising 10 to 30 per cent of births in studies were of blood groups that could not have resulted from anything but adultery.

War is also common in the animal world, Diamond's book argues: "Almost any animal species that has the physical capabilities to murder does it. Not just murder, but mass murder – there's war between prides of lions, packs of wolves and neighbouring troops of chimpanzees."

In the late 1970s, biologists in the wilds of Africa watched with dismay and horror over two years as a troop of chimpanzees made war on a competing group and, one by one, exterminated all the males.

"It's inefficient – they didn't have rockets, atomic bombs or spears. The only way they could kill was for six chimpanzees to jump on a single chimp and beat him for half an hour. Those are the animal precedents for human war," said the biologist who often travels to the Papua New Guinea highlands on anthropological and other field trips.

Studies also show humans tend to mate with those most similar to themselves – not just in religious, political and cultural ways, but in physical attributes right down to eye and lip shapes. Humans with similar characteristics inherently club together and label those not like themselves as outsiders. This is a tribal, animal instinct and the root of racism, Diamond's book says.

But the balding, mild-mannered biologist is quick to point out, just because it's natural doesn't mean we should condone it. If anything makes us human it is our ability to control these age-old impulses and say 'No, I will not kill today'. He argues that by acknowledging the origins of our darker selves, we better learn to deal with them. We are much less barbaric now than we have ever been.

"You can say war is in our genes, but like murder, rape and infanticide, it's something society can choose to suppress," Diamond said. "In traditional societies, murder is widespread. But in the 20th century, despite two world wars, far fewer people have died violent deaths than regularly as a result of murder in traditional societies."

Many of these darker practices still go on: "Most animals practise infanticide, and traditional human societies practise it. But modern industrialised states don't tolerate that. It's natural, it has animal precursors but for the most part we've stamped it out [in the West]," Diamond said.

Why have humans developed so differently from animals? It is a perplexing mystery. A tiny two percent difference was enough for humans to develop language, complex tools, farming and art.

Diamond has a theory – speech did it. With the incredible range of the voice and its ability for pronunciation – unmatched in the animal world – it has allowed humans to explode into the ecosystem and come to dominate the planet.



IN BED WITH KEVIN COSTNER

DAVID DALE

It's about time we figured out the theme for this decade. We're already two years into it, and if we don't put a label on it pretty soon we might find ourselves in the same sort of mess we got into last decade.



David Dale's last column for 21•C was on the 1992 Convention of American Booksellers.

It took the stock market crash of October, 1987 to show us that the theme of the '80s was greed, and by then it was too late to give back all the money we'd borrowed. The 1980s, I would argue, were not so much a decade as a disease. I call it the Decade of Deception, because everybody lied all the time. So, to continue with the alliteration, and possibly out of wishful thinking, I'm tentatively labeling the '90s the Decade of Decency.

Now you're probably saying that it's silly to divide up history in this way. Why should it be possible to find meaningful patterns in 10 year units rather than, say, five years or eight years?

The ancient Romans used the term 'lustrum' for a five year period. It had particular significance for them – after every lustrum the chief priest, the pontifex, would engage in a ritual cleansing of the city, a moral purification, which is something we could certainly adopt in Australian capitals, although we would need to do it rather more often than every five years, I suppose.

But as it turns out, decades are not too bad a way of analysing the way societies change. We can reasonably say that the 1950s were characterised by conformism, the 1960s by idealism, the 1980s by greed and lies, and the 1990s, so far, by a sort of dull commonsense.

You notice I left out the '70s there. I'm having trouble defining what symbolised the '70s. Bell-bottomed trousers perhaps? They did call it the decade that style forgot. Or maybe promiscuity. We often think of the '60s as promiscuous, but back then people only talked about sexual freedom. It took them until the '70s to realise they could actually do it, and then they did it a lot.

We all know what the term "safe sex" means now, but in the '70s, safe sex just meant sex that didn't get you pregnant, or if you were gay, sex that didn't get you arrested.

The Decade of Deception began when Ronald Reagan took office and the TV series *Dynasty* first appeared on television, and ended in the early hours of 1 January, 1990, when we all seemed to wake up with a monumental hang-over and a strong suspicion that we may have done something terribly embarrassing – if only we could remember what it was.

And as we piece together what happened in those terrible 10 years, we have to wonder if wasn't all some fantastic dream...

Did women really wear shoulder pads that wide? Did the banks really give 1.3 billion dollars to Warwick Fairfax to buy a company that his family already controlled? Did Malcolm Fraser really walk into the lobby of a hotel in Memphis with no pants on? Malcolm Fraser?

Did people actually spend a thousand dollars a day on personal transformation workshops, so a 2,000 year-old guru channelled through a Californian housewife could tell them how selfishness was next to godliness? Did Mikhail Gorbachev really knock down the Berlin Wall, and pull apart a perfectly functional military dictatorship that had controlled hundreds of millions of people for more than 60 years?

Did we really eat oat bran every morning so the nouvelle cuisine we were consuming every lunchtime wouldn't kill us? Did we really think John Elliott or Alan Bond would make a great prime minister? Did we really enjoy all that oak essence in our chardonnay? Did we ever actually know what the J-curve was? Did we chop down that many hectares of rainforest?

The difference between the last decade and this one was crystallised for me by a scene in the documentary film *In Bed With Madonna*. Now Madonna is a performer who absolutely typifies the '80s: she wanted success and she fabricated herself to get it. She's all about lies, but we know she's lying and she knows we know.

The whole point with Madonna is that she is Ironic, which was a key word of the time. Remember that thing



people used to do in the '80s where they were talking and make air quotes? That was so we would know they didn't take anything seriously.

In the film, Madonna receives a visit in her dressing room from Kevin Costner. Here is the quintessential '90s symbol. Not a brilliant actor, perhaps, not a genius, but what you see is all there is. Madonna meeting Kevin is like the contrast between Margaret Thatcher and John Major. Or between Ronald Reagan and George Bush – different public figures who define their decades.

So the '80s superstar asks the '90s superstar what he thought of her show, and he replies "I thought it was neat". In the film you see Madonna turn away and pretend to stick her finger down her throat, and out of his hearing she says, "Anybody who says my show is neat has got to go".

Well as it turns out, the joke is on her. After the documentary came out, Costner was asked how he felt about her doing that. He said he didn't mind really, but actually he hadn't thought her show was neat at all. In fact, he thought her show was "kind of disgusting". He said it was neat because he was trying to be polite.

So here we are in the decade of the New Sincerity. I didn't say there would be no lies in the '90s. It's just that they may be told for different reasons than in the previous decade. Out of politeness rather than greed and deceit. Keep watching for the symptoms, and I'll try to give you regular progress reports. ■

FACING PAGE: MADONNA IN *IN BED WITH MADONNA*.
BELOW: KEVIN COSTNER IN *DANCES WITH WOLVES*.



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By Alistair Mant

(Award winning author of *Leaders We Deserve*)

In the second essay in the **Apocalypse? NO!** series, **LEADERS AT THE EDGE** expatriate Alistair Mant, argues that Australia's leadership is in a mess: we don't have any! What is needed is leadership which galvanises the nation behind a vision which the majority share and believe in.

Alistair Mant is an international authority on leadership and management development, and runs a world-wide consultancy practice. His books include *Leaders We Deserve*, *The Rise and Fall of the British Manager*, (quoted by Tom Peters in *In Search of Excellence*), *The Experienced Manager* (otherwise known as the Mant Report for which he was awarded the British Institute of Management's Bowie Medal).

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GREEN PROFIT: DR ROBERT BRINGER

INTERVIEW BY GIB WETTENHALL

Big can be beautiful
when it comes to protecting the environment. Among the world's top 20 income producing companies with an annual sales turnover of A\$18 billion, 3M (Minnesota Mining and Manufacturing Company) has won a string of environmental achievement awards for its 3P programme, 'Pollution Prevention Pays'.



Gib Wettenhall's last column for 21•C was on environmental auditing.

Since introducing the programme in 1975, the multinational company claims to have cut pollution in half, preventing the production of enough waste to fill 1,500 jumbo jets, and in the process saved \$764 million.

With operations in 57 countries, 3M invents, manufactures and markets a wide range of products for the home, office and industry from Scotchgard tape to the energy and waste efficient foam treatment technology used in the manufacture of carpets – which is what brought Dr Robert Bringer to Australia, the man responsible for the introduction of the 3P programme and a world-recognised authority on sustainable development.

Gib Wettenhall met the unassuming Dr Bringer at the launch of 3M's new, 'environmentally-friendly' foamer technology at a carpet manufacturing plant in Melbourne's western suburbs.

What he wanted to find out from this mild-mannered chemical engineer was what made 3M so different that it became the first large corporation to develop a company-wide pollution prevention program, shifting the focus from traditional 'end-of-pipe' pollution control to preventing pollution at its source. What, if anything, was the trigger?

WETTENHALL: David Suzuki is very cynical about industry's capacity to move generally towards sustainable development. He believes that the pursuit of profit and caring for the environment are mutually exclusive.

BRINGER: There's a lot the government can do to change that. If they put the proper incentives in place, they can drive that process. I think personally that competition is really going to drive the whole movement towards sustainable development.

You're moving around the globe a lot. Do you hear much talk about the need for industry to move towards sustainable development? A lot of people say that the critical mass hasn't been reached yet, in terms of where you've got enough peer group pressure across industry.

There is a cadre of leading companies throughout the world with good environmental records, and they're mostly the multinationals coming from the more developed countries.

In the U.S., for instance, there are people like Pacific Gas & Electric, Dow, Monsanto. Ciba Geigy has a good record in this case.

Why do you think it's a function of size?

Mainly because larger companies have been singled out by regulators, environmental groups and the public. Their operations are generally bigger. Quite frankly, in the U.S. many of our regulatory laws at the federal level start by only affecting companies that produce so much waste – 10,000 kilograms a month, let's say. And five or 10 years later, that moves down to 1,000 kilograms a month. So then you bring in a whole group of intermediate size.

It's like tax auditing, then, isn't it?

Yes. And then five years after that, they go down to 100 kilograms a month, and you bring in a whole bunch of smaller companies. It's when those smaller or medium size companies come in, who are our customers – when they start getting hit with all these regulations and it starts costing them money and they start getting fines and they don't have the resources or the understanding... that's when they come back to us.

And that's when we start competing with the other suppliers to those companies, to help them out.

You've given one trigger – regulation – as a reason for a company becoming more environmentally responsible. But, for instance, in 3M's case, in 1975, when those pressures wouldn't have been around to quite the extent they are today, what was the trigger that caused 3M to launch its 3P programme?

Actually, regulation had an effect on our launching it. At 3M, whenever we have some kind of a problem, perceived or otherwise, we always try to evolve some sort of positive approach to solve it, whether it's not enough sales or not enough new products or too high manufacturing costs or whatever – we always have some kind of a programme. It's just our culture as a company.

What sort of culture is that? Did you have a visionary leader? Was it because you had a flat hierarchy?

No, we don't have a flat hierarchy. But in the case of our 3P programme in 1975, there were some regulations that were already affecting us. We were having to install pollution control equipment. In some of our plants, the factory plant managers were complaining to the CEO that here they were being forced to put on this pollution control, which was driving up their manufacturing costs, and they quite frankly couldn't see any value in it. It added no value to their product.

But what's the difference in the nature of 3M, because most companies, when the regulators first moved in, their immediate response was to turn to the lawyers and attempt to tie the regulators up for as long as possible?

That was a negative situation to us, and we wanted to turn it around somehow into something positive, and that's what the 3P programme was all about. We tried to take the emphasis off end-of-the-pipe pollution control that was costing money, and say: "Look, if you don't like that, let's take a look at the production process and see if there isn't a better way to do it."

A truly proactive response...

Oh yeah, very proactive. Our environmental policy began with the statement "Prevent pollution at its source", which in 1975 was unheard of – it really was! And after our programme ran for five or 10 years, and we got some interesting results coming in, we started talking publicly to other companies, governments – whoever would listen – about this approach, saying: "Look – it's working!"

When you started, it really was the "out of sight, out of mind" approach to pollution. What you did was really quite unique for those times. What was it about your corporate culture which enabled you to see the need for change in a positive sense? Yet 17 years down the track there are still a heap of companies whose first reaction is defensive: "We're doing the best we can... it costs too much money to change... of course we believe in the environment."

A big part of our culture has always been innovation. The phrases we used in advertising have innovation in them and we have worked very hard to develop an atmosphere of innovation in the company.

In our technical departments, the design engineers and so on, they have the right to put 15 per cent of their working time towards a project of their choice. It's not only in R & D but in everything we do, so this was just another area where we applied some innovative thinking.

Compared with 20 years ago, when 3M comes up with a new product, how much added pressure is there to look at how environmentally clean the actual manufacturing process is?

Twenty years ago there was very little in there about the environment. Today environmental check lists are sprinkled throughout every phase of product development.

What's also happening today is that rather than doing things in a serial fashion, one day after the other in nice steps, we try to do everything at once. We do the R & D, the design as a manufacturing process, the marketing, everything simultaneously.

Your corporate communication policy

must be pretty intense to get all those people working at once?

Well it is, and we incorporate what we call cross-functional themes very much in the company work. Basically the development of any particular project or product will involve representatives of all disciplines of the company working as a team. It's almost imperative to use them if you are going to push everything together at the same time.

I suppose that's what I mean, getting back to flat hierarchies

3M is a very matrix-managed company in many ways. We have about 50 operating divisions, each of which has global responsibility for its products. We have 56 subsidiaries around the world in various countries and they're responsible for what goes on in their country. In Europe we are just establishing business teams with a leader of corporate

business across Europe. We're going to have one of those for every one of 130 businesses or something like that so if you've got the subsidiaries, you've got the head of the U.S. based division who has global responsibility for his business and the European business teams.

All of these people are matrixed out. I've often said that the ultimate matrix-management is chaos. I think we are moving towards that and somebody like management expert Tom Peters loves it. He thinks that big companies need to have more chaos.

I would just like to follow up on the chaos theory being applied to the corporate management. How important do you think it is that corporations make their processes internally more accountable?

I think the whole idea of matrix management and moving towards chaos is to give individuals in big corporations more responsibility ... the sort of empowerment thing. Push it down, as close to the individual as possible. It's something we're stressing in the environmental area too. Everybody in the company has a role to play now. It may be very small, but everybody can do something, even if it's no more than sitting at the desk and making sure that you have two waste baskets and one of them has the pretty-good-paper to be recycled and the other one has the not-so-good.

Does the corporation offer incentives for development of these processes?

Most of the incentives we have are in the form of recognition programs. Right now we have a new programme called the Chairman's Environmental Leadership Award, and all of our units are encouraged to submit individuals or teams that have carried out particularly interesting environmental projects, whether inside or outside the company. Last year the first award went to a couple of engineers who were the major driving force behind getting a beautiful piece of property in Minnesota designated as a state park. Nobody had been able to do this over the last 150 years, but they did it. ■



DR ROBERT BRINGER

Our environmental policy began

with the statement 'Prevent pollution at its source', which in 1975 was unheard of! And after our programme ran for five or 10 years, and we got some interesting results coming in, we started talking publicly to other companies, governments... saying: "Look – it's working!"



FLOWER POWER: THE SWEET SMELL OF SUCCESS

BARRY JONES

I am a heavy consumer of flowers. No other product is its equal, particularly for their extraordinary symbolism: flowers console, reward, encourage; they signify love, devotion and ecstasy.



Barry Jones' last column for 21•C was on the tabloid press.

They also signal an excellent opportunity for the type of value-added premium product that Australia should be able to specialise in. Horticulture is an activity which requires a high degree of knowledge, skill and patience and can be developed to provide very significant niche markets, both here and abroad.

To fulfil its potential, horticulture must draw together a whole variety of skills: knowledge of market trends, understanding of the psychological needs (and economic capacity) of consumers, making effective use of research, setting medium and long-term goals, working together co-operatively to create a synergy in the industry, and getting access to up-to-date information – information about currency fluctuations, about airline schedules, about trade barriers, about securing expert advice, both here and overseas.

Having been Minister for Science I know something about the quality of work being done in Australian horticulture. I am also very conscious of the role that biotechnology, long an interest of mine, can play in the development of horticulture. Calgene has developed the blue rose and I hope their expectations are fulfilled. The wonderful work of the CSIRO Division of Plant Industry in Canberra with 'gene shears' has enormous implications.

In my electorate a firm is doing exceptionally well in exporting a particular flower to Asia, by recognising and capturing a niche market. Their "flower" is one of the table, not the ornamental, variety: the cauliflower. Over six weeks in 1992 they exported \$615,000 worth of cauliflowers, and their predictions for 1992-93 are between \$5.8 and \$7 million, including broccoli and lettuce as well.

I have drawn attention for some time to the "fine fruit" market in Japan. Japan has refined gift giving down to a fine art. Instead of flowers or wine, the Japanese will often give a piece of packaged fruit. A popular example is the "musk melon", virtually identical in taste to our cantaloupe, and differing only (as far as I can tell) by slightly different skin markings.

Musk melons, wrapped in cellophane, tied up in a ribbon, and in a presentation box (as with chocolates) can sell on the Ginza in Tokyo for between US\$100 and US\$150. Similarly, the Japanese, have a great demand for Damascus grapes presented in mint condition, and where individual grapes (not bunches, the grapes themselves) can sell for US\$3-4 each. At present the musk melons and Damascus grapes come from California, but there is no reason why

Australia could not be growing them here and packaging them in Japan.

We all know that the United States is the world's largest agricultural exporter in dollar value. (It is also number one in volume as well.) But if the U.S. is number one in the world in dollar value, which nation is number two? This is a question I toss out often when I talk to business audiences – and it is very rarely that I get the right answer. Usually people say Canada, or Argentina or Australia. (The utterly ill-informed used to say Russia, although not any more.) The correct answer is the Netherlands.

The Netherlands has an extraordinary position in horticulture, with 60 per cent of world trade. This is a classic illustration of using skills and intelligence to develop international market leadership and, on the way, producing the indispensable but mysterious quality called "reputation". They sell premium goods at a premium price – and customers are satisfied that paying a high price still represents good value for money.

There is a very striking contrast between Australia's role as an agricultural exporter and the Netherlands.

Australia is an exporter of high volume, low added value produce, and can claim (correctly) to be far more efficient than the U.S., Canada or the EEC. Australia exports its produce in tonnes: bulk, undifferentiated goods, essentially invisible, sold generally without tags or flags. These products are then converted into a final form: wheat into bread, barley into beer, corn into breakfast cereal, grapes into wine. Only the beer and wine bears Australian labels and retain a local identity. Wool is exported in greasy form. Beef and lamb is often sold with an Australian label, but not always. But in volume, measured by container load, Australian agricultural exports would be infinitely greater than the Netherlands, but not the dollar value. The great bulk of Australian exports travel by sea.

Where Australians might be selling wheat at \$150-\$200 per tonne, the Dutch can expect a return of millions of dollars for each tonne of exports, since they export products such as cut flowers, bulbs, corns, seeds, cheese with a very high resale value. Most of these products are exported by air: speed is of the essence.

Of course, the Netherlands benefits from its geographical position: barely two hours from any European capital, only eight hours from New York and nine or 10 from Tokyo by the polar route.

Australia does not, of course, have that advantage. Of all the world's great cities, Australia's are the most physically remote from the rest of the populated Western world. Nevertheless, Australia does have the capacity to produce a great variety of products in high and rising demand, to overcome such barriers through the application of information, knowledge and skill.

Australia must take advantage of the new global economy with all its varied tastes and pleasures and not simply rely on the standard bearer of raw materials and energy to see us into the next century. Besides they don't smell as sweet. ■

21•C

READERSHIP PROFILE

21•C has been published by The Australian Commission for the Future since Summer 1990. Since its launch it has established a unique position in the Australian publishing world and a solid and loyal readership. Its blend of science, technology, futures and environmental issues has met with popular acclaim. It has established a reputation for authoritative writing and for having its finger on the pulse of contemporary issues.

A reader survey form was enclosed in the sixth edition of 21•C (Winter 1992) in order to gain an insight into its readership and give readers the opportunity to comment on the direction of the magazine. Almost 1000 readers responded and the results were highly positive.

THE AVERAGE 21•C READER

The average 21•C reader is around 40 years old with a tertiary education. Eight per cent work in influential decision making positions such as parliamentarians, managers and advisors and a further 49% are professionals. 21•C readers have, on average, bought four editions of the magazine and non-library copies were shared with 3.3 other people. If a conservative 15 readers is allowed for each of the 54 librarian purchased copies, the average number of people reading a 21•C increases to at least six. This would bring a conservative readership figure for 21•C to 50,000 per edition.

The survey found that respondents are extremely positive about continuing to buy 21•C and often recommend 21•C to others.

CHARACTERISTICS OF 21•C

Respondents indicate that 21•C:

- provides good study material
- has a good variety of topics
- has an easy to understand writing style
- has an attractive, easy to read layout
- is easy to find copies to buy.

WHAT THE RESPONDENTS ENJOY

21•C readers enjoy:

- travel
- reading
- going to movies, theatres or concerts

INTERESTS RELATING TO EDITORIAL

21•C readers are interested in:

- the environment
- the future and futures issues
- new technology break-throughs
- scientific issues, Australian issues
- social issues
- the Asia/Pacific region
- culture and arts
- community action and politics
- overseas in general
- economics.

THE BUYING DECISION

Analysis was carried out to determine what factors, aside from price would directly influence the buying decision if it were altered. The two factors that had this influence were: most strongly, having a good variety of topics; and less strongly new technology and break-throughs. Both of these items had a high positive response.

Size is not a critical buying decision and neither are any of the other enjoyment or interest factors.

Our thanks to those readers who participated in the survey, and we hope that you will maintain an interactive role with 21•C through our letters pages.

Susan Oliver

MANAGING DIRECTOR
AUSTRALIAN COMMISSION FOR THE FUTURE LTD.

THE FIRST GLOBAL REVOLUTION

by Alexander King and Bertrand Schneider
Simon and Schuster, Australia, 1992

BEYOND THE LIMITS: GLOBAL COLLAPSE OR A SUSTAINABLE FUTURE

by Donella Meadows, Dennis Meadows and
Jorgen Randers
Earthscan Publications Ltd, London, 1992

REVIEWED BY RICK SLAUGHTER

As we near the end of the second millennium, the view that humankind is passing through a major transition is gaining ground. Part of the credit for this must go to the Club of Rome (CoR). For all its isolationism and connotations of a 'rich man's club', it has sponsored a whole series of publications and forums, and thereby heightened awareness throughout the world of the many dimensions of the human predicament. Its term 'problematique', or interlocking series of major global problems, has passed into the language of the environmental debate.

The First Global Revolution takes its title from the view that a new type of society (based on advanced communications and biological technologies) is taking shape simultaneously around the world. Or, at least, it would do so were it not for the debt crisis and the stubbornly increasing gap between 'rich' and 'poor'. So a good part of this book is devoted to outlining the possible 'resolutique', or resolution to these global problems. The prescriptions offered are sound enough, but they are not particularly new. Much is made of three areas: the conversion of resources from military to civil uses; the need to achieve much higher energy efficiencies and deal with global warming, and the need for new strategies to close the rich/poor gap.

King and Schneider do not hold out much hope of governments acting effectively; they are part of the problem. So the burden falls on others: educationalists, scientists, NGOs, activists, responsible journal-

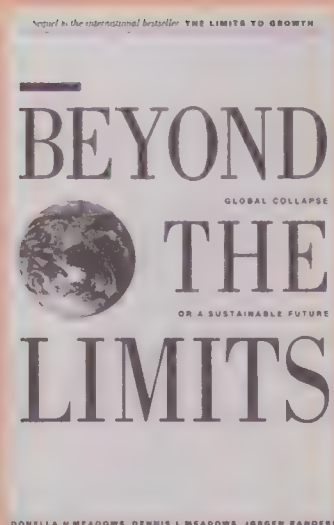
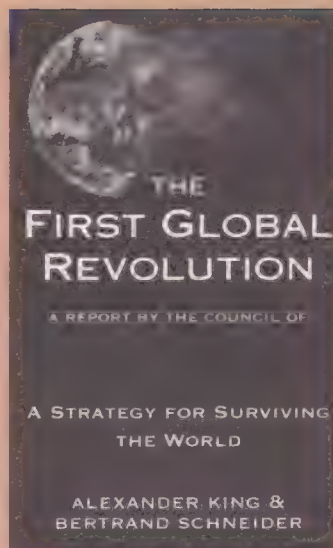
ists and so on. The need for a new, or renewed set of values is well-argued. Unfortunately, while the diagnosis is accurate enough, it is not new. The book mainly restates what we already know – which is pretty much in line with what we have come to expect from the CoR: a sensible, honest, middle-of-the-road view, with little in the way of originality. While readers are likely to agree with most or all of the book's ideas, it does little to carry the debate forward. In summary, it works well for those

wanting a competent contemporary overview, but it fails to break new ground or illuminate ways out of the trap provided by current leading-edge thinking.

Beyond the Limits is a book of a completely different order. Its authors have matured enormously in the 20 years since the publication of the original *Limits to Growth*. Their new book is quite simply the most original, useful and coherent I have seen on the dynamics of the transition to sustainability.

Whereas many writers slip into an almost preachy, "we know best" mode of expression, Meadows, Meadows and Randers are in exquisite control of their subject. They have their model (World3) [sic], and they understand its limitations. They understand their own biases and turn them to advantage. They speak as scientists or systems analysts, yet end their book with a very human chapter written more from the heart, as it were, than the computer. So why does it succeed so well?

Beyond the Limits has a clear and easy-to-follow structure. It begins with a lucid account of exponential growth as a driving force, and the very severe dangers it brings with it. I believe that few planners, politicians or policy-makers are aware of the implications, either locally or globally. It continues with



a very accessible account of the nature of limits on the planet: the sources of raw materials and the ultimate 'sinks', or final destinations, of wastes and pollutants. It then considers the dynamics of growth in a finite world. Near the end of this chapter is a passage which encapsulates a key part of the book's message:

Because of the time it takes for forests to grow, populations to age, pollutants to work their way through the ecosystem, polluted waters to clear, capital plants to depreciate, and people to be educated or retrained, the economic system can't change overnight, even if it gets and acknowledges clear and timely signals that it should do so. *To steer correctly, a system with inherent physical momentum needs to be looking decades ahead.* (p.137. My emphasis.)

This provides a simple, yet powerful rationale for much greater social investment in foresight. It is one our leaders should take note of and then apply.

The remainder of the book paints a picture which, if not totally optimistic, certainly provides substantial reasons for hope. It considers how the world has responded to the ozone threat in ways that may prevent the worst scenarios from occurring. This is rightly used as a sign that humans can respond to perceived threats *before their worst manifestations occur*, and then act. There are many other systems which require similar attention well before they reach the stage of 'overshoot and collapse'. However, the authors do make it clear that, in contrast to prevailing conventional wisdom, markets and technology alone do **not** have the capacity to prevent global deterioration. Something more is needed. That something is dealt with in the final chapters.

First, governance and policy-making at all levels needs to be directly informed by an understanding of the *dynamics* of a transition toward sustainability. This is not a simple or obvious task. Which helps to explain (but not justify) why such insights have so often been lacking both in the literature on global problems and in the so-far mainly pathetic responses of governments to them. How many governments are deliberately and systematically informed by structured foresight and global modelling? Yet without them 'overshoot and collapse' are virtually inevita-

The First Global Revolution works well for those wanting a competent contemporary overview, but it fails to break new ground. *Beyond the Limits* is a book of a completely different order... It gives simply the most original, useful and coherent I have seen on the dynamics of the transition to sustainability.

ble. We are still driving into the future with our eyes fixed on the past. (But a *different* past with different, more forgiving, dynamics so distant from the limits now being breached.)

Second, a number of human and cultural shifts are outlined with skill and restraint. They include: visioning, networking, truth-telling, learning and loving. To reproduce such a list risks misrepresenting what these talented researchers have achieved here. For, unlike so many others, they understand their own limits *and* the limits of their method. This is a real achievement. I hope that *Beyond the Limits* is read and debated even more widely than its predecessor. It is essential reading for everyone who is concerned about the future and wants to play a part in the greatest challenge facing humankind: the transition to sustainability.

If, in a different universe, the Club of Rome had existed solely to begin the 20 year process that led to this book, it would have been worthwhile. I know of no better way to empower oneself to resist the looming dystopias of the coming century than to read and then apply it in every possible way.

UNDERSTANDING THE PRESENT

by Bryan Appleyard
Picador, London, 1992

REVIEWED BY PAUL HENDY

Bryan Appleyard's *Understanding the Present* is the strongest critique of traditional science ever to reach our bookshelves. This "cultural historian" attacks "scientism" – the arrogant belief that "science is or can be the complete and only explanation" to nature and about ourselves. He also attacks "triumphant scientism", the belief that "science alone can lead us to God", which is represented in the currently popular quest of the cosmologists and mathematicians searching for a "Theory of Everything". This 'triumphalism' is outside the jurisdiction of science according to Appleyard.

Furthermore, in this admittedly highly biased history of science, Appleyard explores the emergent amorality of science which he thinks has infected our liberal-democratic Western society. It is, he says, a "spiritual corrosive" and "moral neutraliser" and has dire consequences for future humanity. He adds that an "emergency" exists: "we must find our true nature" before the high priests of "cold-eyed classicism", "alien invaders in disguise", cross any more frontiers, especially the "final frontier of the self" (to define consciousness and feelings rationally).

Understanding the Present is packed with insights, protestations and loathings which are liable to shock, anger and alienate many rationalists and popularisers of science. In Britain, the book is being labelled "dangerous" by some researchers, who see the rhetoric used as a weapon by politicians to "hold down science budgets". But Appleyard's goal is a more humane post-scientific age, one which has "goodness, purpose and meaning".

The story essentially breaks down to a clash between two great minds and their different ways of knowing – Stephen Hawking, the eminent Cambridge University theoretician defending triumphant scientism and, the 400 year old doctrines of science

rationality and simplification, and in the other corner, little known and little understood, Ludwig Wittgenstein, Cambridge University philosopher. Wittgenstein's work explores a different way of knowing in which there are not so many problems in the world as 'blockages' created in our minds from science and logic. "The sole remaining task of philosophy is the analysis of language", he argued. Essentially, Wittgenstein's insight points to language being a dynamic which can answer questions about nature and our true selves, and highlight the flaws in scientific reasoning.

As Wittgenstein states: "we feel that even when all possible scientific questions have been answered, the problems of life remain completely untouched".

To understand *Understanding the Present* we must look at this behind-the-scenes contest which has "contributed unwittingly to the genesis of the book". When Appleyard interviewed Hawking in 1988 and popped the question of Wittgenstein's 'language' idea to him, he replied dismissively, "I do not think so". The theoretician even wrote "what a comedown" in his unlikely bestseller *A Brief History of Time: From the Big Bang to Black Holes* (1988).

For Appleyard, who believes that Wittgenstein's insights have "immense and profound implications", it was a tremendous shock. It made him realise that one of our greatest scientific "rationalists" exhibits not only "a startling philosophical naivety", but also a supreme "contempt" for other ways of knowing.

Furthermore, when Appleyard interviewed Jane Hawking a week later, the theoretician's wife began to pour out fears about the direction her husband's work was leading in his search for a "theory of everything" which could expose "the mind of God". Hawking was asking "does the universe need a creator, and if so who created him", and finally in the infamous "no boundary condition" of a universe without beginning or end, a creator was dispensed with entirely, a view which Hawking aired at the Vatican, before the Pope. Jane Hawking, being a devout Anglican, felt her atheist husband had crossed the line in beginning to answer questions which should be left to faith not physics.

So the first aim of Appleyard's book is to chart how science has evolved over 400 years to this arrogant "domineering" monopolist position where it now believes that it is the one and only true way of knowing which is leading all humanity to greater truths, to solve "the big question".

Mary Midgely, philosopher at the University of Newcastle-on-Tyne, in her book *Science as Salvation* (1992), supports Appleyard's contention that this over-confidence in science "lies in the success of technology – the most conspicuous sign of the effectiveness of science". She also adds that the current fantastic prophecies by the 'mind of God' cult represent the scientism of "omnicompetence".

Appleyard's *Understanding the Present* is thus about understanding the meaning and the mind of science and the limits and boundaries to this way of knowing. Science is "a magnificent failure", he says, and the limits are evident from the quantum and chaos

theory of the "new physics" which are shaking the certainty out of scientific doctrines, revealing the flaws in the reasoning that all facts can be proved and knowable.

Appleyard widens his thesis to explore amorality and other detrimental effects of scientism. Science, he declares, "is not a neutral or innocent commodity, rather it is a spiritual corrosive – it burns away all competition". It has "supplanted religions and cultures", and is "quietly and inexplicitly talking us into abandoning ourselves, our true selves". "Life is re-

Understanding the Present is the strongest critique of traditional science ever to reach our bookshelves. [Appleyard] attacks "scientism" – the arrogant belief that "science is or can be the complete and only explanation" to nature and about ourselves.

duced to a series of separate problems with separate answers", resulting in "appalling spiritual damage" and there is "much more science can still do".

This leads Appleyard to some controversial leaps in his argument. He links science with our modern liberal-democratic society and says that "liberalism" has adopted science's tolerance, moral neutrality and spiritual corruption. He goes so far as to imply that the economic rationalists, bureaucrats and technocrats who have married rationality with growth and progress, are "the new realisation of evil" just beyond this narcissism. This analysis deconstructs science, politics and society.

These assertions led a *Nature* editor to declare the book "dangerous... the supposed corrosion of belief by science will readily provoke the view that the world will be safer with less science... that rationality will be blamed for supposedly novel social ills.... There are politicians all too ready to listen to Appleyard's assault on reason."

An *Economist* reviewer agreed that the book "is beautifully written – a rational demolition of rationalism – but Mr Appleyard slyly equates liberalism with science and thus a new 'Endarkment'... [but hasn't] man been mostly unreflective, greedy, cynical and amoral in every age?"

Those in favour of Appleyard are equally colourful. John Gummer, the conservative agriculture minister, who sits on the Church of England synod, says the book has "reclaimed the universe for humanity... fact is no longer the only reality that matters".

How to put a soul back into homo-scientificus and homo-liberalist? Appleyard leaves many open-ended assertions because it is his religion not to adopt science's faith in solutions. It is the public discourse and cultural melting pot which is Appleyard's living thesis, that 'language' according to Wittgenstein, with its uncertainties and incompleteness can act as a metaphor to break science's arrogant "certainty" and "scientism" and perhaps cause "a cultural revolution in science".

[Epilogue: Pan books has purchased 1,000 copies of *Understanding the Present* for Australia – *A Brief History of Time* has sold 50,000 copies.]



LASERS ON MY MIND

WILSON DA SILVA

Six years ago, neurosurgeon Andrew Kaye would have given his patient 36 weeks to live. Today, after brain surgery, radiation therapy and firing lasers into the man's head, the same patient is still visiting the Melbourne medic.

Such is the promise of photodynamic therapy, a little-known branch of medical science that uses lasers and sensitiser dyes, which is exciting oncologists around the world. Professor Kaye, at Melbourne University's Department of Surgery at the Royal Melbourne Hospital, is on the leading edge of its application on brain tumours and is one of a host of scientists working to refine it for general application against the scourge of cancer.

Central to the therapy are specially designed sensitiser dyes which are harmless when injected into patients. They drain from normal tissue in the body by the second or third day after injection but – probably due to the poor drainage system in tumours – remain soaked inside tumour tissue and even within individual cancer cells.

When irradiated with particular wavelengths of laser light, the dyes turn nasty. Chemical reactions ensue, releasing lethal elements that react with lipids on the surface of tumour cells lying in the laser's path, rupturing them and killing the tumour. As the dyes mostly drain from normal tissue, there is little 'collateral damage'.

Photodynamic therapy has been tested on skin, bladder, uterus, eye and bowel cancers, achieving tumour reductions of between 50 and 100 per cent. A group in Britain, led by Professor David Phillips of London's Imperial College and University of London colleague Professor Steven Brown, has used lasers and dyes to destroy tumours in mice, rats and rabbits since animal trials began late last year. Clinical trials on humans have now begun in Britain and results are expected around mid-1993.

On a recent lecture tour of Australia and New Zealand, Professor Phillips told *21•C* the therapy is safer, cleaner, quicker and cheaper than using radiation and has applications in dentistry, in unblocking clogged arteries and in more rapid diagnosis of a number of ills. Professor Phillips' dyes, developed over the past eight years, have successfully killed tumours in the pancreas of animals. "It destroyed pancreas tumours totally," Professor Phillips said. "Some normal tissue was also killed, but some normal tissue was also regenerated."

Based on his research, Professor Phillips said the technique would probably be applied to tumours in the bladder, colon, breast, brain, and surface tissue, but not lung cancer.

Professor Kaye has concentrated on brain tumours, and began researching the therapy in 1984, treating his first tumour two years later. The veteran of neurosurgical training in London and Cleveland now leads a team of local and international scientists pushing back the frontiers of the technique.

About 600 people die in Australia annually from cerebral glioma, the most common form of adult brain tumour. Standard treatment is to remove the visible tumour surgically and then blast the target area with radiation in the hope of killing off what is left behind. But even then, the average survival period is 36 weeks after treatment.

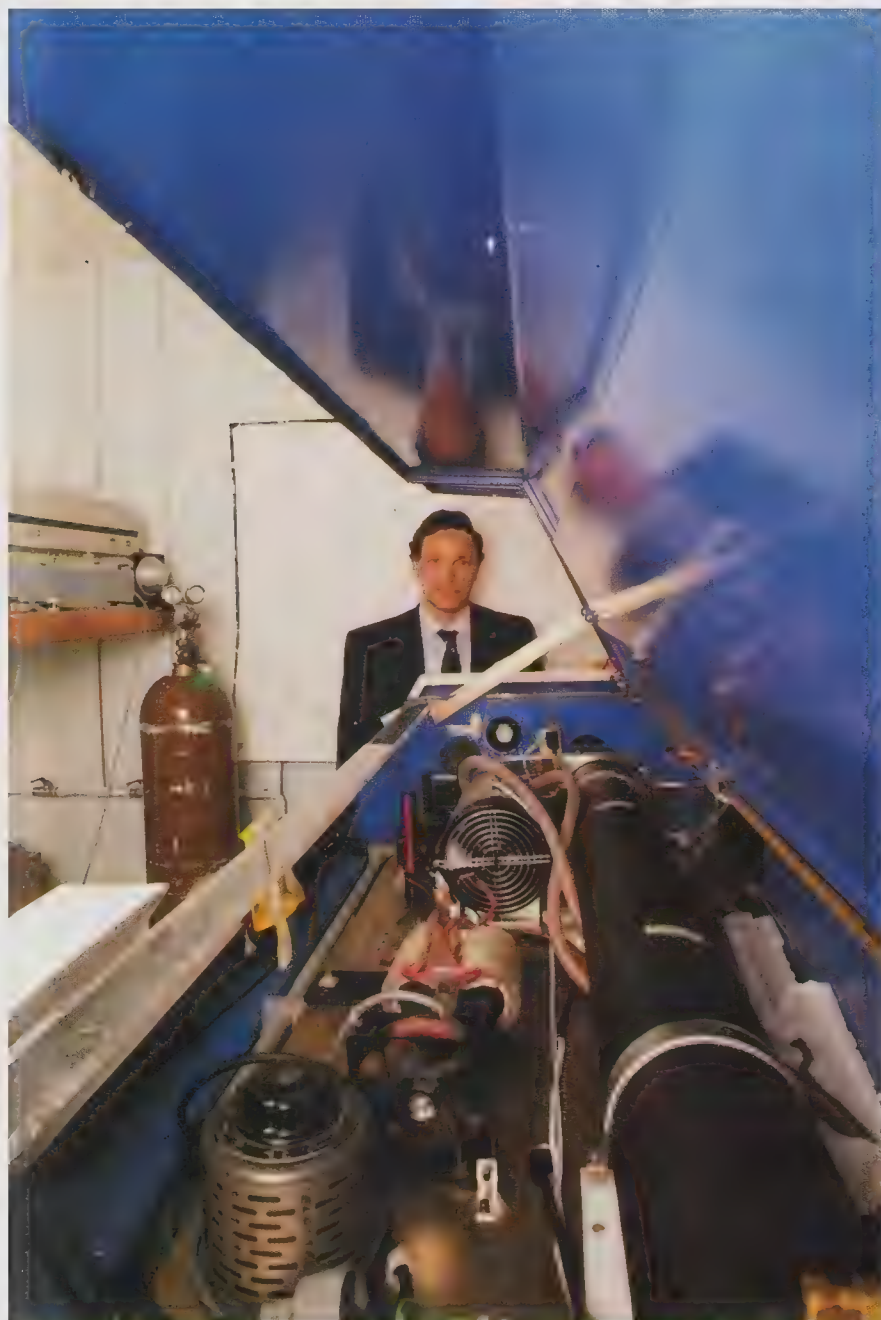
"It's terrible. Although we can remove all the tumour we can see, there is still the roots of the tumour that are left, and these are growing a long way, deeply into the brain," Professor Kaye said from his rooms at the Royal Melbourne Hospital. "It's not possible to remove the roots of these tumours without destroying very important areas of the brain, just as it's not possible to remove the roots of a tree without disturbing the soil."

With photodynamic therapy, the bulk of the tumour is surgically removed as normal, and while the skull is still open, lasers are fired into the region around the tumour base, activating tumour tissue soaked with sensitisers.

The therapy is still experimental and much work needs to be done on developing more potent dyes, or making dyes that are activated by higher laser wavelengths which more easily penetrate tissue. Nevertheless, some 1,000 people have been treated with photodynamic therapy around the world and Professor Kaye, who has treated more than 100 patients says it is prolonging lives: "At the moment we have a median survival of two years, but we also have patients who have survived longer than two years".

But the therapy is not a cure. Professor Kaye's team is in "phase two" of trials – treating people as they come forward and following up their cases. Before he can say the therapy is a complete success, more rigorous trials will be needed in which one group of patients is treated with photodynamic therapy and the other not.

"Patients come to me for the treatment, and it's very hard to tell them 'no, I'm trying to develop better techniques'. So if we start upon a 'phase three' trial, we're stuck with using old techniques until we finish it, which may take two or three years."



PROFESSOR DAVID KAYE
OF THE UNIVERSITY OF MELBOURNE'S
DEPARTMENT OF SURGERY AT THE
ROYAL MELBOURNE HOSPITAL.
(PHOTOGRAPH: ANDRZEJ LIGUZ.)

"After five years you'd hope it was a cure. But on the other hand that's been six years whereas he might have only lived 36 weeks.

"We have to improve the sensitiser and the light delivery system, and this can only happen by investigating the basic sciences behind photochemistry and laser physics," Professor Kaye said.

"The 'Nirvana' of the treatment would be a dye that got into every cancer cell in the brain no matter where it was scattered, and a light that could penetrate the whole of the brain, and activate every cancer cell. That may never be achievable, or it may be," Professor Kaye said.

Professor Phillips' research, funded by a British cancer charity, has not been patented in the hope that it will be brought into commercial application quickly.

"We'd like to see these things get into the clinics as soon as possible," Professor Phillips said. "The sensitisers are not expensive to make, but realistically they are another three years away [from application]."

Photochemistry, the little-known branch of science from which the technique developed, has been around for a while: "It's gone [through] somewhat of a resurrection in the last 10 years. It's been discovered, forgotten and rediscovered," Professor Phillips said.

Using light in medical treatment has been around since the 1880s, when physician Niels Finsen cured unsightly winter sores on the faces of tuberculosis sufferers by shining filtered light on them. He won a Nobel prize for the work.

Ironically for someone who works with coloured lasers, Professor Phillips is colourblind. "I never would have thought I would have earned a living from coloured light," he said with a smile. ■

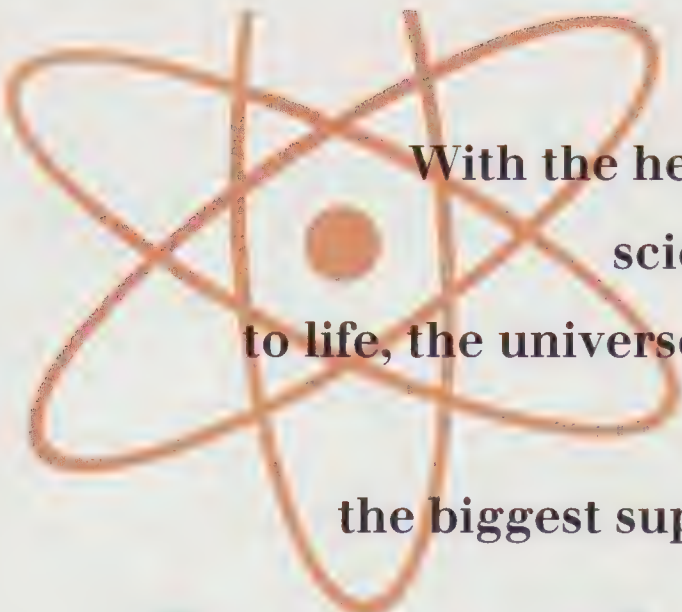
For throat and superficial bladder cancer, some 'phase three' trials have already begun in North America.

Professor Kaye started with \$10,000 funding, and is now running the ground-breaking studies with an annual \$400,000 budget. His group is backed by the Anti-Cancer Council of Victoria, the National Health and Medical Research Council, the Stroke Research Foundation, Royal Melbourne Hospital, the Royal Australasian College of Surgeons and Melbourne University. But the process is labour intensive, the lasers used are very expensive pieces of high technology, and 'phase three' trials are beyond the group's resources.

His team, along with others around the world, is also trying to improve its lasers. At present it uses a gold-metal-vapour laser made in Australia and an imported argon-dye laser, and is about to take delivery of an innovative copper-bromide laser developed in Adelaide that allows flexibility in setting wavelengths.

"I'm cautiously optimistic that the survival has improved and the treatment is working, but it is not curing patients," Professor Kaye said. It certainly isn't. That same patient he first treated in 1986 has recently developed a recurrence of the tumour.

"The 'Nirvana' of the treatment would be a dye that got into every cancer cell in the brain, no matter where it was... and a light that could penetrate the whole of the brain, and activate every cancer cell."



With the help of a few billion dollars
scientists are about to discover the secret
to life, the universe and more-or-less everything.

Stuart Tovey reports on the building of
the biggest superconductors in the world.

fundamental as anything!

MOST SMALL CHILDREN HAVE THE CURIOSITY TO BE potential scientists. If your children throw toys at the wall or hit them with a hammer, just for the pure joy of seeing them smash into pieces, don't despair. They are probably asking themselves the question that has intrigued scientists for centuries: while most objects are composite and can be broken into smaller entities, are there some that are indivisible? Are there a few "fundamental building blocks" or "elementary particles" from which our whole universe can be constructed?

Scientists try to answer this question in a rather crude way. Taking a particle considered to be fundamental, like an electron, they accelerate it to the highest achievable speed, then smash it into a target to see if it breaks up. If it does then it is certainly not fundamental! The difference between the child's game and scientists' experiments is that the accelerators used to destroy the particles are very big and very, very expensive.

Two new accelerators – by far the most powerful ever constructed – will be built in the 1990s. The first experiments should commence in the year 2000. They are the accelerators for the 21st century, or at least the first few decades. The biggest machine is the Superconducting Super Collider (SSC) to be constructed near Dallas, Texas. It will be roughly circular with a circumference of 86 km. The price tag is US\$7 billion and rising. Slightly

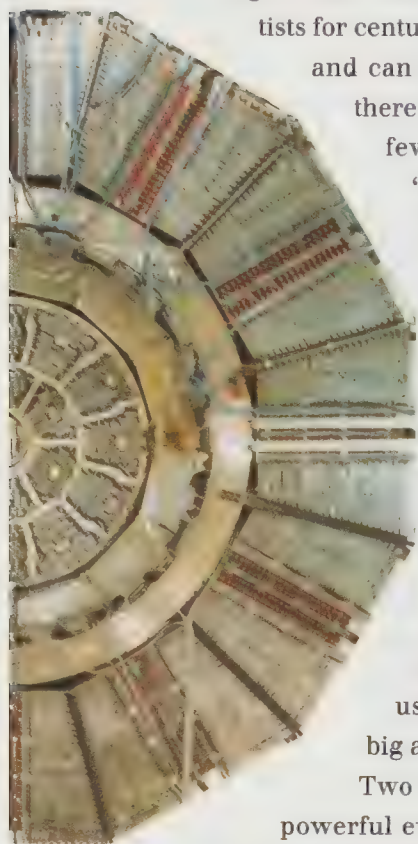
smaller is the Large Hadron Collider (LHC) to be built by the European Laboratory for Particle Physics (CERN) near Geneva. It will cost less than the SSC, partly because it is smaller and partly because it will build on existing infrastructure.

There are two obvious questions to address before describing these machines. Why do we need even one accelerator with a price tag like that? And, why have two accelerators with price tags like that? High energy physicists use their giant machines to study 'inner space', the physical world at a very small scale. Astronomers study 'outer space', the physical universe at a very large scale. These are the two fundamental frontiers in the physical universe and they are closely related. Scientists in both disciplines want at least one such accelerator built. Each group closely follows the research done by the other group.

With these new machines we can scientifically approach some of the most fundamental intellectual questions ever asked. For example, what was the universe like a billionth of a second after the Big Bang which is thought to have started it? What will its fate be? Is matter itself intrinsically unstable? Are the particles we currently consider as fundamental really so?

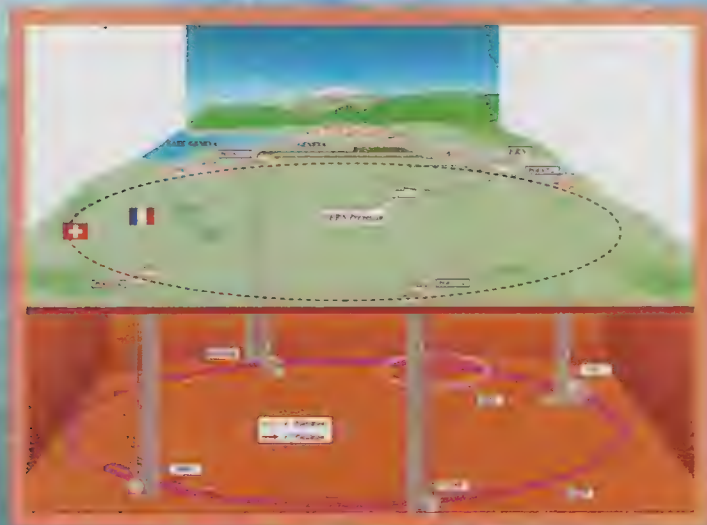
So, is the price tag for one machine too big? Instead of measuring the cost of these machines in units like US dollars and Swiss francs, tally them in terms of battleships or Exocet missiles, not to mention Gulf Wars, and it becomes a small number.

The next question: why two machines? The answer is more pragmatic. In the words of one European minister for Science, "Europe needs frontier projects like this as a locomotive to drive its industries". The U.S. needs its locomotive



(Above) LEP
Detector

Aerial view of CERN laboratory, the rings indicate the position of the LEP and SPS tunnels. (Inset) Cutaway diagram of LEP.



too. And it's the reason that Japan is planning an accelerator even more ambitious than the two discussed here.

The tunnel in which the LHC will be built already exists, deep underground straddling the French-Swiss border. It is 27 km in circumference and it contains CERN's present frontier accelerator, the Large Electron Positron collider (LEP). The new machine, LHC, will ride piggy-back on top of the LEP machine. It too will consist of two giant racetracks. Bunches of protons (the nucleus of hydrogen, the lightest element) will be circulating in each ring, clockwise in one, anti-clockwise in the other. At selected points the counter rotating beams collide head-on and, very occasionally, say once in every billion billion collisions, an event occurs which might provide a clue to new phenomena. It is the job of the engineers to make the collisions happen, then the physicists have to recognise those ever so rare events and study them.

The speed at which the protons collide is so near to the speed of light that the difference will be unmeasurable. More important is how energetic the protons will be. In the LHC the kinetic energy of each proton will be over 8,000 times its rest energy. In the SSC it's more like 21,000 times.

To bend these energetic protons so they travel in a circle requires a chain of magnets filling almost the entire circumference of the machine. And it will need magnetic fields that have been reached before over a small volume but never on such a scale. The planned magnets will use superconducting materials operating just 2.2 degrees above absolute zero temperature. They are an immense challenge to industry.

An accelerator is of no use unless there is a 'detector' to record what happens when the protons collide. Some of the most impressive detectors yet built were made at CERN for its present machine (LEP) and just a glance at some of the images give a rough indication of the endeavour involved in constructing them. The LHC and SSC detectors will present far greater challenges. Many physicists in all parts of the world are already fully involved in their design as it is abundantly clear that present technology cannot cope.

Nobody knows if, or how, the new machines will rewrite the textbooks. Our ideas as to what is really fundamental have changed three times in the last century and could be about to change again. Today we have evidence that our immensely complex world is built from a relatively small number (although still too large for the peace of mind of many physicists) of 'elementary particles'. The particles

have charges which enable them to experience the four basic forces. The best known of these is electric charge through which particles sense electromagnetic forces. Less obvious is mass, the 'charge' through which particles experience the gravitational force. The charge that allows some particles to experience this strong force is whimsically called colour (although it is quite unrelated to the that colours we see). The weak force is 'universal', that is the same for all particles, and we do not need to specify a charge.

Each particle has an anti-particle, having the same mass but opposite electric and colour charge. Thus the familiar electron, negatively charged, is partnered by the positively charged

anti-electron (usually called the positron). Just four particles, with their "antis", can explain almost all of the world we inhabit.

These are:

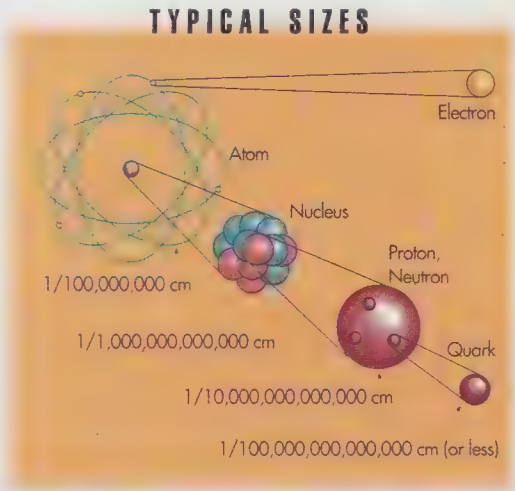
NAME (SYMBOL)	ELECTRIC CHARGE	COLOUR CHARGE
LEPTONS		
Electron (e)	-1	0
Neutrino (ν_e)	0	0
QUARKS		
Up (u)	+2/3	Red, Green, Blue
Down (d)	-1/3	Red, Green, Blue

The difference between quarks and leptons is that quarks experience the strong force while leptons are immune to it. That small difference is key to building the world we know.

How can we build everything from humans to ants, trees to stars from these blocks? Bind two u-quarks and one d-quark (one of each colour) and we have a colourless proton with electric charge +1. Make that one u-quark and two d-quarks and we have a colourless, electrically-neutral neutron.

Bind various numbers of protons and neutrons and we make nuclei, add electrons to make atoms, bind atoms to make molecules. These molecules may be as simple as HO or as complex as DNA, but they are all made only from those three building blocks: the two types of quarks and the electron.

I didn't forget the neutrinos. However they are not needed to build matter. Instead they are produced, in vast numbers, by the sun and by all other stars. We live in a sea of neutrinos which fills the universe. They are so inert that we have to go to great trouble even to prove that they are



Norman Robinson

Table 1 / THE SECOND & THIRD FAMILIES

NAME (SYMBOL)	ELECTRIC CHARGE	COLOUR CHARGE
.....		
Muon Leptons (μ)	-1	0
Mu-neutrino (ν_μ)	0	0
Charm Quarks (c)	+2/3	Red, Green, Blue
Strange Quarks (s)	-1/3	Red, Green, Blue
Tau Leptons (τ)	-1	0
Tau-neutrino (ν_τ)	0	0
Top Quarks* (t)	+2/3	Red, Green, Blue
Bottom Quarks (b)	-1/3	Red, Green, Blue

*Evidence for the t-quark is indirect but no one doubts its existence. Are there more families of quarks and leptons awaiting discovery? Most physicists think not. But we've been surprised before.



Mock-up of LHC (Large Hadron Collider) installed in the LEP tunnel.

there. And they pass through solid bodies like the Earth as if it were empty space. For reasons nature hasn't revealed it decided to replicate this 'first family' of particles, adding two new families of leptons and quarks as shown in table 1.

The four forces are also transmitted by the exchange of particles, although of a different type, neither leptons nor quarks. (You can find their names and a few of their properties in table 2.)

If we go back to the end of the last century most scientists agreed that the fundamental building blocks had been discovered. They were the atoms of the 90 elements which make up the periodic table, from hydrogen through to uranium. The very word atom is derived from the Greek for indivisible.

Ernest Rutherford and his co-workers destroyed that view by showing first that the atom is a composite object with a nucleus surrounded by electrons. He then showed that all the nuclei, except that of hydrogen, were composites and were simply different mixtures of protons and neutrons. It left a beautifully simple picture with only one flaw: nature had chosen differently, the picture was wrong.

While many have heard of Rutherford, the lesser known winners of the 1990

Nobel Prize for physics Friedman, Kendall and Taylor are as important, as they completely rewrote the textbooks.

In the mid-1960s they repeated "Rutherford's experiment" (which was actually performed by Geiger and Marsden). They used the biggest accelerator then available, the "Two Mile" linear accelerator at Stanford University near San Francisco, to smash very energetic electrons against target protons and neutrons. The electrons passed the test and are still regarded as fundamental. But the targets were revealed as being composite, constructed from quarks.

It is mainly as a result of their experiments that the present day answer to the question "What is really fundamental?" is given here.

To finish on a light note; one problem about which the builders of these new giant machines will not have to worry is the supply of hydrogen to supply the circulating protons. If both machines ran non-stop, for two decades, and hopefully reveal the secrets of the universe, the total mass of hydrogen accelerated would amount to about a millionth of a gram, a speck far too small to be seen. ●

Stuart Tovey is Director of the Research Centre for High Energy Physics at the University of Melbourne. He works on experiments at CERN and elsewhere on the nature of Elementary Particles.

Table 2 / THE FORCE CARRIERS

FORCE	PARTICLE(S)	SYMBOLS
Electro-magnetic	Photons	γ
Weak	Asthenons(*)	$W^+ Z^0 W^-$
Strong	Gluons(**)	G
Gravity	Gravitons(***)	g

* Only a few, trying to demonstrate how erudite they are, use this term. To the rest of us they are "the W and Z".
 ** There are eight, with various hues.
 *** The graviton has yet to be observed.

LIFE IN THE ARTIFICIAL FUZZY LANE


A close-up, high-contrast image of a metallic, robotic face. The face is made of polished metal with visible rivets and bolts. It has two glowing red eyes and a wide, toothy grin showing sharp, yellowed teeth. The lighting is dramatic, highlighting the metallic textures and the intense expression of the robot.

Three storeys below the teeming cacophony of Kowloon in Hong Kong, at a platform of the Tsim Sha Tsui subway station, a billboard with sprinter Carl Lewis advertises a television set. Using artificial intelligence, the unit delivers a crisper, more realistic picture, a smiling Lewis informs the hurrying millions who whiz past. A split-screen photograph shows the difference in the image of a Bengali tiger.

So this is it, I thought while on a recent visit – artificial intelligence in the family home. I guess I visualised artificial intelligence as something you would find driving a servant robot or an android bartender that greets you by name and knows your favourite poison. But as always with the march of technology in a society so fond of mod-cons, the pedestrian things are the first to be touched by the future.

It's hard to believe that just over a decade ago Artificial Intelligence – AI to *aficionados* – was in virtual decline. A pessimism about the slow pace of advances prevailed and a growing number of scientists despaired about finding practical applications.

But advances in the 1980s, commercialisation successes and a perceived threat from a big-budget Japanese assault on AI helped revive the field. Today, AI is not only embedded in Hong Kong television, but in use in Tasmanian pulp mills, New South Wales banking and sheep shearing robots in Western Australia.

 One branch of AI research currently turning in quite a few dollars is 'expert systems'. These are large and complex pieces of software that mimic the thinking process of human experts – be they chemical engineers in a factory or bank managers considering loan applications. Researchers interview the experts in detail, picking their brains for how they would react to a host of situations, and then design a logic lattice incorporating their expertise. That way, a cybernetic engineer or bank manager is on tap 24 hours a day. In a factory, a chemical engineering expert system could monitor thousands of sensory inputs, note slight variations in a manufacturing process that a human might miss, deduce the problem, warn the flesh-and-blood engineer that a potential problem was building up and offer a solution. The engineer would then investigate and if in agreement, act on the electronic tip-off.

"There are lots of little problems out there, all of which are amenable to expert systems," researcher Phil Collier of the University of Tasmania said from Hobart. "They are good for solving problems an expert could solve over a telephone."

Collier and his team of students have installed an expert system at the Pasminco Metals smelter in Risdon, Tasmania, which monitors the hydrometallurgical process for dealing

with zinc concentrates. Another University of Tasmania researcher, Paul Crowther, has also installed an expert system at the Associated Pulp and Paper Mills facility in Burnie, Tasmania, which monitors recovery of expensive chemicals from the pine pulping process.



AI is also about to arrive at branches of the State Bank of New South Wales. Its Consumer Loan Assistant expert system will help managers make decisions about whether a potential loan applicant is a good risk. Based on the answers to countless interviews with bank managers and analysis of loans that went bad, the expert system will make a balanced judgement – unimpeded by race, sex or ethnic background. "You can have bank officers

enter details into the computer and it will make a preliminary decision about whether an applicant should get a loan," said Sue Zawa, the bank's manager of new technologies.

Zawa said expert systems could be applied to money market dealing rooms. An expert system could plough through the volumes of technical data – currency swings, fluctuations in bond interest rates, gross national product figures – constantly monitoring minute changes in the direction of the market and advising on steps to take to protect the bank's investments or identify an opportunity for the bank to make a quick killing. This would free up dealers to pay more attention to the human element of markets – to decide whether a comment by Treasurer John Dawkins augurs tighter or looser monetary policy, or whether a remark by Prime Minister Paul Keating suggests

greater or lower government spending – all of which can see millions of dollars in bonds and other securities changing hands in seconds.

One of the advantages of an expert system is that it never blinks. It doesn't lose concentration, go to the bathroom or get bored – all of which can affect the most able experts and lead them to miss a vital clue in a developing situation. More attentive operators might have prevented Chernobyl, as a more attentive crew might have saved flight KAL 007.



AI is blossoming, and applications are squirming their way into all facets of life. Auditing at some local banks utilises AI, as do some high-powered programs for scheduling international air flights, and a new air traffic management system is being developed by the Civil Aviation Authority. An Australian company, ISR Holdings Ltd, has developed a fifth-generation computer language called XL that mimics reasoning ability and operates on existing Unix computer systems. The company has seen its share price leap on the Australian Stock Exchange since announcing a partnership with Japanese trading house C. Itoh to develop

The fuzzy logic that makes the artificial intelligent is already in washing machines and production lines. But how close are we to simulating neurons for a virtual cortex?
BY WILSON DA SILVA.

the technology further. Even Australian beer, of all things, is succumbing to cybernetic brain cells. Carlton & United Breweries Ltd is working with the Melbourne-based Australian Artificial Intelligence Institute to develop scheduling systems for its packaging plant.

The Institute is on the leading edge of local AI, and is even doing work for the American space agency NASA on developing diagnostic systems for the international *Freedom* space station. Other Institute partners include shipping company Conaust Ltd, miner CRA Ltd, the Australian Army and Telecom.

Another field of AI entering commercial application in a big way is neural networks. These are the closest things to human brains, or to what little we understand of the mysterious grey lumps. They are machines that for all intents and purposes, think through a problem and offer solutions based on previous experience. They also learn from experience. They arrive at solutions like a human being with a command of logic would, and like a human brain cannot be opened up so the process can be tracked.

"You can train it, give it lots of examples and it will make judgements," said Dr Stephen Hood of the Defence Science and Technology Organisation in Adelaide. "It's analogous to the human brain. It's great if you want speed, but [like human brains] you can't look inside it to double-check, to see how the solution was arrived at."

"AI is very broad," said Professor Robin Stanton of the Australian National University in Canberra. "It covers a lot of people doing a lot of different things."



There are more than 300 researchers working on AI in universities, government science agencies and corporations in Australia, of which less than a third spends most of their time on AI. Some, such as Professor Ross Quinlan of the University of New South Wales in Sydney, lead the world in 'machine learning' and 'decision trees'.

Australia is not an outcast in the world of AI, but not often a leader either. Local expertise is recognised enough for the 1991 confab of AI, the International Joint Conference on Artificial Intelligence, to be held in Sydney. Among the luminaries was AI godfather Professor Marvin Minsky of the United States and young turk Rodney Brooks of Adelaide, now on top of the AI tree working at Boston's Massachusetts Institute of Technology.

A look through the two phonebook-sized programmes to the conference showed just how hard are the problems still facing the ultimate goal of AI – a thinking, joking, straight-talking intelligence. Problems being tackled include visual object recognition, algorithms that speed up decision-making, competing theories for how reasoning could best work in a machine – it goes on and on. Many researchers admit to occasionally despairing, especially those in the 'hard-AI' school who believe it possible to create something like the HAL computer of *2001: A Space Odyssey* or a Commander Data of *Star Trek – The Next Generation*.

The 'soft-AI' school doesn't really care – they are just keen to apply AI wherever it's needed or can make a buck.

But many argue that AI will always be hampered by what little we know about the human brain. How can we imitate something we don't really understand in the first place? "Trying to understand the cognitive behaviour which creates that challenging, mystifying and highly engaging behaviour we know as intelligence," said Prof. Stanton, who is also chairman of the Australian Computer Society's national AI committee. "That's the challenge. Most people really believe we will create an intelligent, surrogate companion."

Prof. Stanton said the rational components of brain activity can be mimicked, but not the irrational: "It's only the rational that is going to be replicated. Humans are erratic and irrational, I think it is beyond us to make an intelligence that would match the engaging and emotionally complex behaviour we take for granted."



One thing becomes clear about the quest for the manufactured mind – how incredibly complex our own is.

Things like taking down messages from the telephone, recalling the taste of some dish and comparing it to the meal you're eating, or reading a book while pedalling an exercise bike – these are all complex tasks that require a lot of mental firepower. When you break such simple actions into their constituent commands and try to write a program for a machine to imitate – then you realise the power of the grey neurons you take for granted.

It's been half a century since the first true computers were wired up, but we have yet to create an artificial intelligence anywhere near the intellect of your average moggy, and are certainly far from producing anything as erudite as HAL the shipboard computer.

"If one talks about the capability of a say, one or two-year-old child, I think we're at that level now," said Professor Ray Jarvis of Monash University, an AI researcher and president of the Australian Robot Association. "What we'd like to be able to do is push it up, maybe to five or six, or seven or eight, within the next decade. If we get to the capability anywhere near that of a five or six-year-old child... we've really got a winner."

Some argue that AI is heading down the wrong path by trying to mimic human thinking. They say it is its own unique brand of thinking, separate and independent of the human thinking processes.

Others, like Prof. Minsky, believe computers can match humans and in many cases already "think". They exhibit all the signs of a child that is clever, precocious, impressive; but also stupefyingly dumb. In seconds they can sort through confusing reams of data and pick out emerging trends, schedule air flights and runways while allowing for wind resistance and estimated times of arrival – but cannot tell the difference between a dog and a car, nor navigate in a room without bumping into furniture.

In his book, *Society of Minds*, Prof. Minsky argues that intelligence is not one simple, all-encompassing presence


but most likely a co-operative association between a myriad of interacting 'thought tasks'. These thought tasks, all very fast, very focused on single problems and very dumb, are run by one very simple traffic management program we would call sentience, awareness, or – if you really want to push it – the soul.

"If you're holding a cup of coffee, you don't want to have to think about whether the cup is tilting," Prof. Minsky told 21•C in an interview last year at IJCAI '91, demonstrating the point by holding up a white china cup of coffee away from the saucer. "In the spinal column and the cerebellum, you set up little automatic sub-robots that keep measuring the pressure on your thumb and your finger, and if there's more pressure on your thumb, it sends a message back to your wrist to rotate and keep the cup level.

"And that doesn't bother the part of you that's talking or doing other things," he said. In such a way, the brain acts as if it were "300 or 400 rather complicated computers in a big network".

Prof. Minsky said the old AI approach of greater speed and computing power is never going to create a thinking computer that can match the diversity and flexibility of human thinking: "You can't do this sort of thinking by brute force. Thinking is too clever and tricky. But you can do it by 300 different approaches and somehow managing them to work together. You can say that machines *are* thinking, they're just thinking dumb little thoughts," Prof. Minsky said. "They're very precise and very fast, but they're limited thoughts."

Prof. Minsky gave conference participants a stirring, rally-round-the-flag speech at the conference, urging scientists to press ahead with AI applications and saying research was now bringing the day of cybernetic consciousness closer.

 Some researchers are not so upbeat: "It's the old story. You can climb a tree and say you're on the way to the Moon, but there's still a long way to go. That gets you down sometimes," said one Australian AI scientist.

Japan has tried to kick-start the process. In 1982 the powerful Ministry for International Trade and Industry (MITI) announced a 50 billion yen (\$550 million) 10-year programme to develop fifth generation computer technology. This was a bold attempt to tackle some of the big barriers in AI, and was greeted by a mixture of derision and panic. Derision because Japan was not highly regarded in the computer science world, and panic because some Western researchers were afraid that a Nipponese 'Manhattan Project' might crack some of the big questions and leave the West in the shadow of the Rising Sun.

The Institute for New Generation Computer Technology

(ICOT) was created and for a decade worked with 200 Japanese researchers and 75 scientists from 12 countries on a host of very tough AI problems. Yet, despite the saddlebags of cash, it has been widely labelled a failure. At a recent international conference in Tokyo, director Kazuhiro Fuchi defended the group's work.

"We had to face criticism based on the false impression that it was a reckless project trying to tackle impossible goals," he told delegates on the 10th anniversary of the project's birth. Fuchi said the institute had successfully laid the groundwork for fifth generation computer technologies so advanced they are unlikely to be seen for five or ten years. "We are proud to say we have created the core."

The project did spawn what are probably the best programming systems in the world, and brought a generation of young Japanese scientists into AI research, said technology analyst David Kahaner of the U.S. Office of Naval Research in a recent report on the project. As a consequence, Japan is no longer on the bottom-rung of computer science. But the hardware and software developed by ICOT is unused or unusable outside of Japan, and little used inside the country, he said.



MITI hasn't given up. On the tenth anniversary conference it announced it would renounce all proprietary claim to ICOT software – in the hope of encouraging its wider use – and move to convert the lessons learned from ICOT's research into Unix or C, powerful computer languages widely used in the West. This amounts to 70 large programs, including parallel operating software, parallel logic programming languages

and other high-end computer applications. Fuchi said that today's advanced computer applications like Unix, C and RISC are only now being applied when they have been around 10 to 20 years.

But Fuchi admitted that the project, directed by a committee, had its difficulties. Setting out to design a horse, the committee had instead produced a camel, he said. ICOT will continue while another project – the Real World Computing Project – will be funded until 1995 and designed to create fast and powerful computers that can do intelligence-intensive tasks.

Spectacular research failures are the sorts of things that give AI a bad name and scares industry away, Prof. Stanton said. "People remember the successes and say, that was 20 years ahead of its time," he said. "But they equally forget the failures and the dead-ends. ICOT may well prove to be 10 or 20 years ahead of its time, or it will peter out and be forgotten. No-one knows."

To avoid the bad public relations, proponents sell AI to

**"Humans are erratic
and irrational, I
think it is beyond us
to make an intelli-
gence that would
match the engaging
and emotionally
complex behaviour
we take for granted."
Prof. Robin Stanton, ANU**

industry under a different label. Researchers say it sounds too blue sky for the grey-suit brigade, whose eyes glaze with images of *Star Trek* and *Robocop* at its very mention. Collier calls his AI system an “operator’s assistant”, while Zawa calls hers a “knowledge based system”.

The whole question of integrating artificial intelligence into something approaching human form is a whole separate front of the research war. It is also one that has been arguably more successfully commercialised – there are now an estimated 330,000 robots around the world, and Australia is home to about 1,400. Japan leads with 176,100 and the United States with 33,000, but underdeveloped nations are quickly entering the field – Czechoslovakia has 5,700, Taiwan 700 and Brazil 120.

There are still many problems to solve before we reach the androids of *Star Wars* or *Terminator 2*, or the replicants of *Blade-runner*. Object recognition, visual systems, mobility in a three-dimensional environment – bringing AI into the real world of humans will take some time. But robots are already performing a surprising range of tasks – agriculture and livestock handling, ocean development and fisheries, transportation and warehousing, medical care, civil engineering, building maintenance, fire-fighting – along with the more traditional assembly-line work.

A robot in Denmark trims bones from fish, the U.S. Postal Service has contracted a company to build a toilet-cleaning robot, and a computer-controlled 26-metre arm washes jumbo jets. Maybe that android bartender is not such a crazy prospect after all.

Are some AI systems already thinking? Dr Paul Thistlewaite of the Australian National University wonders if researchers will ever be certain: “I don’t know if we’ll ever be able to tell. What is clear is they [AI systems] can certainly do some fairly smart things. And the number of smart things is increasing.”

Yes, but when will we have a machine that can sit with us and sip *cappuccinos* by the beach? Perhaps never, perhaps it is only a generation away. Meanwhile, the consumer fruits of AI research will continue to creep into our homes – already this year stores are selling washing machines that use ‘fuzzy logic’ to guess your wishes. Can a dryer that doesn’t lose your socks be all that far away? ●

HAL

Intelligent machines may be a great boon to human-kind. They may also be quite capable of murder.

Ashley Crawford profiles Michael Georgeff of Australia’s Artificial Intelligence Institute.

The concept of Artificial Intelligence (AI) seems to inspire incredulity tinged with fear. It calls into question the thought systems and indeed the very social structure upon which human kind judges its own development. Intelligence is something that is praised. Dumbness is contemptible. Intelligence serves to distinguish us from animals. In a society based on so-called intelligent use of knowledge and awareness, the very thought that a ‘dumb’ machine may one day emulate such an ability is at once shocking and bewildering, for it begs the question – how exactly do we think, and what exactly is intelligence?

As with nanotechnology and virtual reality, AI is beginning to capture the public imagination. When ‘thinking’ machines were first proposed, in the mid 1800s by Charles Babbage, the concept was rapidly dismissed as “useless”. Admittedly, Babbage’s prototypes were crude, and it was faster to use a human as a calculator than his cumbersome calculating machines. But the potential was born.

We should, of course, no longer think in terms of bulky machinery when considering the complex computers that will house AI. As Pulitzer prize winner Douglas Hofstadter pointed out in his *Metamagical Themes: Questing for the Essence of Mind and Pattern*: “Why don’t you let the word ‘machine’ conjure up images of patterns of dancing light rather than of giant steam shovels?”

Since Babbage’s day, when steam shovels were perhaps the more apt imagery, technology has moved apace. Even Babbage may have been dumbfounded when, in 1950, Alan Turing came up with his ‘imitation game’ – a test based on conversational ability and knowledge which would ‘prove’ whether a machine was in fact intelligent.

In the late ’80s and early ’90s AI has become not only an established computer and social science, it is also big business. Centres of research, backed by both government and private enterprise funding,

on Earth.

have grown around the world. Amongst the world leaders in this field is Dr Michael Georgeff.

Dr Georgeff, now institute director of the Australian Artificial Intelligence Institute (AAIL) in Melbourne, was programme director for five years at the leading U.S. AI research and development group Stanford Research Institute (SRI). In 1988 then science minister Barry Jones and Senator John Button persuaded Dr Georgeff to return to Australia to establish AAIL. The institute was founded by the Australian company Computer Power, the Victorian Government and SRI.

The first private enterprise/governmental and international partnership in AI allowed AAIL to develop research and development projects for an international market. A client list was rapidly established to include such strange bedfellows as the Australian and U.S. Defence Departments, Carlton and United Breweries, NASA and Telecom.

Given the range of possibilities that AI suggests, it is not surprising to find conflicting notions even within the AI community as to what AI could, or should, be – and even what it should do. Georgeff's approach is perhaps on the more pragmatic edge, the creation of machines that have immediate applications and uses for humankind. However he is the first to admit that the emphasis of much AI research has changed from the practical to the philosophical.

"The kind of thing that I, and others in the AI community, are trying to build is what we could think of as 'artificial creatures' that get around in complex dynamic environments. Rather than designing machines to 'be intelligent', we design them to survive," says Georgeff. "How would you build a machine to act rationally in an environment? In trying to build such machines you might imagine how amoeba work, that is, in very particular niches they get around very well without what we might call intelligence. However if you go up the scale, the sort of creatures that you want to get around more complex environments and to adapt to these environments need more and more 'intelligence'.

"A lot of the original motivation for AI was to build machines to get around tough environments, and somehow we got sidetracked into trying to build machines that could play chess." The question of creating 'intelligence' stems back to the days of Ada Lovelace and Charles Babbage. Indeed Lovelace is perhaps the first researcher to speculate on the potential of Babbage's 'Analytical Engine' – the crude prototype of today's computers – to play chess and compose music – in the mid-1800s! As an alternative to such abstract

approaches, Georgeff cites the work of Dr Rodney Brooks, an Australian scientist working as associate professor of computer science at MIT. Brooks' ambition is to see his tiny insect-like robots scuttling over the surface of Mars on exploratory missions (see feature in issue 4 of 21•C).

"Many researchers in AI are now trying to build artificial creatures, such as those at the amoeba level that Rodney Brooks is working on, through to creatures that could get around in a very complex worlds, not only dangerous or difficult for humans like nuclear reactors or underwater, but including what we would call 'virtual worlds'. In worlds such as telecommunications networks, the computer senses communications traffic and overloads, but that world is as real to the computer as our world is to us. So one has the problem – how does one build these agents to get around in their particular environment?"



DR MICHAEL GEORGEFF.

To Dr Georgeff's way of thinking there are two clashing approaches between theoretical notions and practical applications. As seems often the case in debates about the potential of real intelligence in an artificial system, the Turing test acts as a cornerstone for debate.

"From my point of view a more interesting test is one that tests the survivability of the machine in a complex environment. In one sense the Turing Test could be adapted to have the machine die if it failed the test. It comes down to how well or not you can simulate human capabilities."

The ability to survive, for any organic species, naturally revolves around a number of variables. Perhaps the most important are emotional responses such as rage and fear.

"No one has yet put up a good argument for why one would want to have a computer that suddenly got fearful or aggressive."



"2001 – A Space Odyssey": Frank and Dave discuss what to do about HAL, as the 'neurotic' computer reads their lips in the background.

"The notion of intelligence proposed by the Turing test misses a truly vital element to building survivable machines, and that is it forgets, to a large extent, the problem of having to act in a timely way. In one sense, if the machine takes years to answer, it would fail the test." A lousy conversationalist by anybody's standards.

"It doesn't take into account what humans do have, the ability to plan. They can take time planning a holiday, but if they happen to be crossing a street and a car starts bearing down on them, they don't spend time planning whether to jump left or lie down in the middle of the road – they act spontaneously. And there is a whole range of behaviour in between. You can't build a machine saying there are a certain class of situations it should react quickly to and another where it can plan. The problem is the machine actually has to spend some time just to decide whether it is in a situation

where it has to move quickly and how much time it has to actually think about that.

"So the Turing test misses all this incredible richness which we don't have a very good handle on at the moment – it's almost a question of how do you build a machine that knows when to stop thinking," says Georgeff.

"If you look at every sort of creature that has developed in the world they have an essential first capability – the ability to react appropriately to change – and as you get more intelligent you have to be able to balance that off against your goal-directed behaviour; if you're always reacting to change you never achieve anything. So you have a scale of types of human agents who range from cautious ones – who do a lot of thinking – to bold ones, who tend to be very reactive. And it's certainly the case for the sort of computer systems we're building at AAIL that by changing some of their properties we can make them very cautious or very bold and so have them display a range of characteristics that in a sense reflect the way certain humans get around.

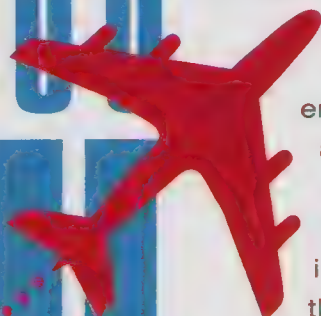
"In order to do that properly, a significant group within the AI community have been building machines where the machine structure itself has elements which correspond to certain human mental attitudes. Those mental attitudes are

what we call the 'belief' of the system. The 'desires' of the system, which are the things which drive it to doing things, and the other mental attitude is that of 'intention'. We actually design the computer so that it has these three mental attitudes – belief, desire and intention. With those attitudes we can build machines that start to be able to achieve this rational balance, to be able to balance off acting towards their goals against being run over by a truck."

In a chilling example of the structuring of an artificial intelligence system, Georgeff addressed the American Astronautical Society in 1987, using the example of HAL, the almost malevolent computer system in Stanley Kubrick's 1968 science fiction classic *2001 – A Space Odyssey*. Georgeff outlined the abilities that HAL featured in Kubrick's fictional year of 2001 and concluded that most of HAL's characteristics, such as speech recognition and speech generation, its ability to look after the various spacecraft systems including communications, the power and life support systems and its diagnosing of faults, were all within the realm of immediate realisation.

However, as anyone who has seen *2001* will recall, HAL's talents backfire on the hapless astronauts, especially the character Dave who plans to disconnect HAL. In order to perform all of 'his' tasks, HAL had to be given what AI experts call 'practical reasoning'. He had to have goals to achieve and certain beliefs about how the world is and how it works. Given those goals and beliefs, HAL had to be able to form plans or intentions as to how to **CONTINUED ON PAGE 95**

FLYING TOO HIGH



Psychologically, those at the top are often the least suited to be there.

ALISTAIR MANT
investigates the blunders - potential and real - which could affect us all, from pilot error to Three Mile Island.

While there is an enormous amount of scientific research into how to make machines smarter, almost no-one is looking at the human in charge of the hi-tech vehicle. Few researchers have considered - let alone understood - the necessity for this matching of wits.

Take the case of airline pilots. We know from research that something like 80 per cent of airline accidents are caused primarily by 'pilot error'. But what does this mean? It means that time and again it is the psychology of the flight crew, rather than any failure in technical systems, which has played the major part in the accident.

Matching humans to their machinery through what is known as socio-technical systems analysis confronts formidable problems in trying to make operations more efficient and less prone to blunders. For a start, organisations have hardly begun addressing the way the natural processes of occupational choice leads to error.

Take the case of airline pilots again. We know from socio-technical research that the kinds of people who want to be pilots are exactly the kinds of people who are most prone to certain kinds of mistakes under pressure. No amount of safety drills or rules can alter this disturbing truth. These men (plus a few women) are very much of a psychological type that not only

desires a flying career, but will generally countenance no other way of making a living whatsoever. In one of the better known psychometric profiles, 85 per cent of pilots exhibited a pattern of preferences found in only 17 per cent of the general population. The pattern is that of an individual who strongly prefers to learn from discrete data sources rather than by intuitive pattern-ing, comes to a quick, incisive decision rather than scanning for options, and almost invariably tries to take decisions according to strict internal logic rather than tuning in to the views of others.

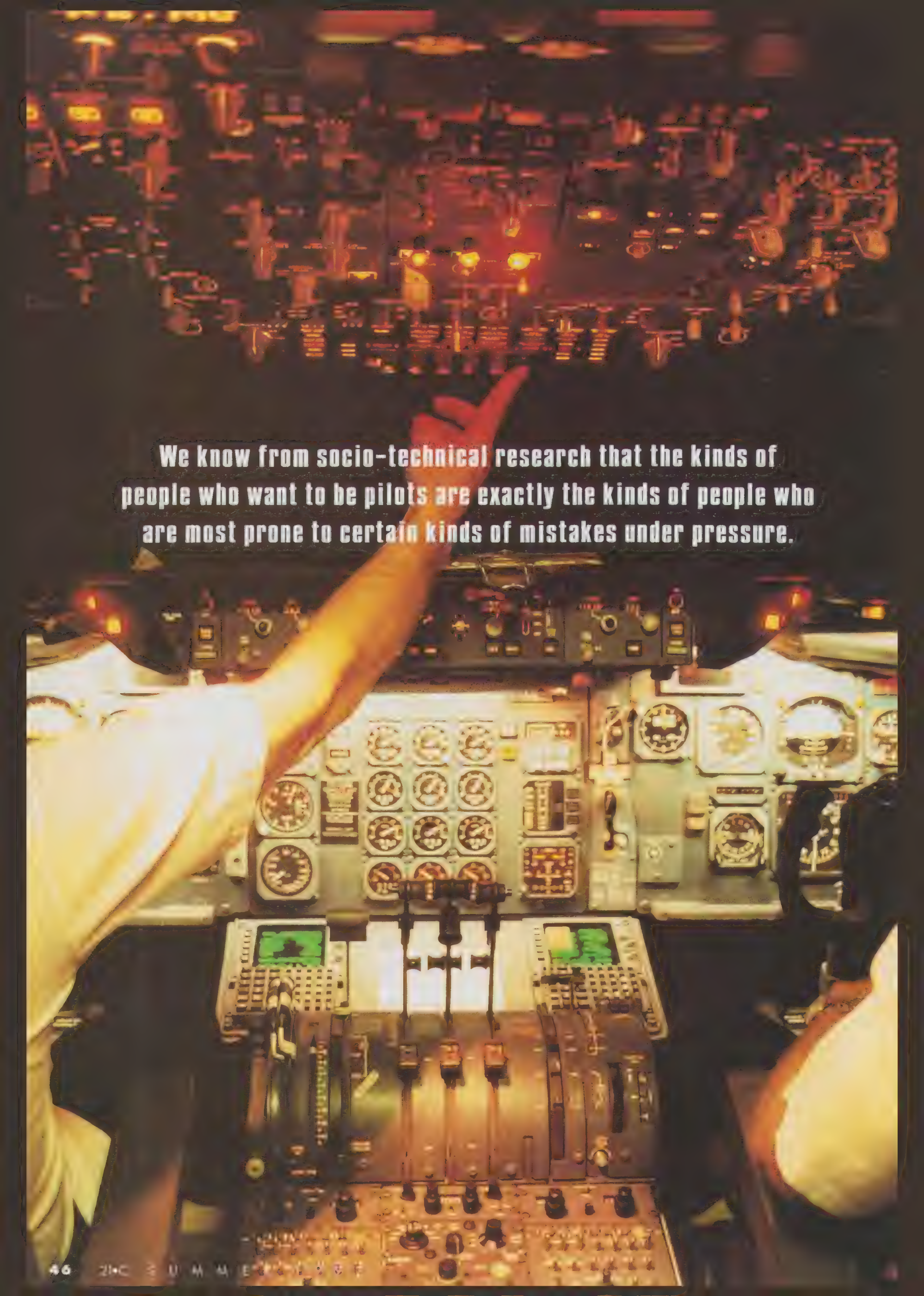
What this means is that the typical pilot is perfectly adapted to 99.9 per cent of the routine work of flying a modern airliner. But modern technology has rendered this routine work relatively unimportant.

Unfortunately, however, the typical pilot is almost the opposite of the person you would wish to find on the flight deck coping with the other 0.1 per cent - the situation where everything is going wrong and the information available is governed by uncertainty and ambiguity. Fifty years ago, those who wanted to be pilots were well adapted to their calling. Nowadays, the people are similar but the whole socio-technological milieu has changed. Until a few years ago, there was invariably a flight engineer in the cockpit with a somewhat different mind set to the two pilots. Now the engineer has been supplanted by computing power. Technologically (and perhaps even financially) it makes sense, but only time will tell whether the real usefulness of the engineer was to argue with pilots (if need be) when things got confusing. An enormous amount of research effort has gone into the ergonomics of the modern cockpit but no thought at all appears to have been devoted to the impact of this simple change.

Flying is clearly not the only occupation where socio-technical systems failure arises. We live in an age of blunders; it seems unfair to single out 'pilot error' when we have the example before us of the mismanagement of national economies by politicians and their civil servant mandarins.

Similar examples can be found in the accountancy fields and the military. Dr Norman Dixon has outlined in his book *On the Psychology of Military Incompetence* how those who seek psychological refuge in army life are bound to make inadequate commanders under fire. Evidence suggests that the self-punishing psychology of typical police recruits causes a rigid approach to detection which leads in turn to the pursuit of erroneous conclusions long after they ought to have been consigned to a logical scrapheap.

Perhaps this is not the place to comment on the ambitions of politicians and the likelihood of finding true statesmen in their ranks. As the great French essayist de la Bruyere put it: "men fall from great for-

A photograph of an airplane cockpit. A hand is pointing towards the overhead panel, which is filled with numerous switches and lights. The instrument panel below the hand features several analog gauges and two small digital displays. The cockpit is dimly lit, with the primary light source coming from the instrument panel and the overhead lights.

We know from socio-technical research that the kinds of people who want to be pilots are exactly the kinds of people who are most prone to certain kinds of mistakes under pressure.

tune because of the same shortcomings that lead to their rise!”.

If one were to seek the greatest threat to national progress, an ideal reference would be an old book by the great Canadian sociologist Lionel Tiger entitled *Men in Groups*. This fascinating treatise sets out a theory of why men in groups sometimes lose their individual wits. Irving Janis' classic study of how the Bay of Pigs invasion was planned is the standard practical modern case study of how individually “intelligent” men (or at least men from the CIA with a paranoia of Cuban communism) can arrive at a stupid collective decision.

Economics, of course, is the classic socio-technical system; it is perhaps the most behavioural of all the behavioural sciences. You would think, therefore, that a group of economists who were almost invariably correct in their predictions must be doing something right, particularly if the track record of accuracy goes back many years. Such a group is Professor Wynne Godley's Economics Policy Unit at Cambridge. Some years ago, this group lost its support grant from one of the main U.K. government research agencies on the grounds that its methods were “too intuitive”. It cut no ice with the agency that somehow they were always right, whereas the preferred economists had proven a capacity over the years to be almost invariably wrong.

Perhaps we need to redefine brightness and stupidity. It has become clear over the years that when major disasters occur, there is invariably a small army of low-status, but intelligent, doubters who foresee trouble. This was true of the Zeebrugge sinking, the Aferfan tip slide, Three Mile Island (where a number of doubters had ample time to make a movie predicting the kind of disaster which eventually occurred) and most of the big financial collapses of recent years. Yet, the bosses, most of whom have passed a great many formal examinations, seem to lack the imaginative capacity to make the important mental linkages.

Significantly, women, who tend to be good at intuitive thought, rarely rise to the top. Instead, we generally find the crude “group thinking” processes of coalitions of powerful men, not one of whom is prepared to speak, or think, out of turn.

If we have the courage to rethink what we mean by “intelligence” there are a few reliable maps of the terrain. If we accept Howard Gardner's argument there are probably about seven distinct intelligences, perhaps associated with different neural locations. Yet we examine our children's educational progress on just one or two of them – especially the logico-mathematical and the verbal.

The work of Professor Elliot Jaques and his colleagues in business and academia provides us with a strong theoretical framework for thinking about levels of capability and the best ways of predicting, assessing

and developing it. Jaques argues that there is a necessarily limited supply of very high capacity people in any population and it is therefore of crucial importance to any society to unearth it and put it to best use. Otherwise, the society will fail in the international contest.

It is important to assess performance in a methodical way, but there is no substitute for judgement when it comes to predicting the future. Sir Geoffrey Vickers, in his famous book *The Art of Judgement* put it this way: “Judgement, it seems, is an ultimate category, which can only be approved or condemned by a further exercise of the same ability”.

Statements like this, though true, may be seen as rather unhelpful in the practical world. The solution may be found in the concept of time, not space. There are people who never make mistakes in character judgement or prediction. They have a proven track-record over many years. They could not make such a mistake if they tried. There is little point in trying to distill the “competencies” of such people; they themselves could not tell you how they do it. The point is to deploy those with such proven gifts when important selections have to be made, backed up by psychometrics or whatever, if desired. Better still, equip such people with a sound method, such as that developed by Professor Jaques, based on the systematic testing of

It is clear to those who work in complex technological systems that the number of people who do actually understand what is going on is a very small minority.

capacity to grapple with complexity, and supported by exhaustive biographical review. His colleague, Professor Gillian Stamp, is actively involved with a number of Australian organisations in extending and developing these methods.

Given the complexity and sophistication of modern technology, it is quite remarkable how well things work most of the time. But it is clear to those who work in complex technological systems that the number of people who do actually understand what is going on is a very small minority of the whole population. The difficulty for these people is to be heard and understood by the majority. In the future, successful countries will be those which are quickest to grasp these fundamentals and build institutions which reflect them. That is where the “practical” operators come in. It is time to fight back. ● Alistair Mant is a world-renowned management consultant. His last story for 21-C was “The Leaders We Deserve”.



Homer's Odyssey

McKenzie Wark looks into the future of TV families.

What America needs is families like *The Waltons*, not families like *The Simpsons*, according to former U.S. President George Bush. A strange remark, given that one does not normally expect to hear the President of the United States pass judgement on television dramas like *The Waltons*, let alone cartoon shows like *The Simpsons*.

The producers of *The Simpsons* were quick to respond, by making Bart Simpson remark that the Simpson family was really just like the Waltons – waiting for the end of the depression. *The Waltons* were an imaginary rural family waiting for the '30s depression to end, while *The Simpsons* are a postmodern family of today. Both belong to the curious history of the American TV family. A history so central to the past, present and future of American culture that no-one – not even presidential candidates – can afford to ignore it.

It was only 100 years ago that presidential candidates in America said things like: "you shall not crucify mankind upon a cross of gold". Now they talk with religious zeal about television. The common cultural language no longer comes out of the Sunday schools, it is the language of TV. The irony of Bush's remarks is that while he may want Americans to return to an old fash-

Homer Simpson and his postmodern brood are the most intriguing of the new torch bearers for that phenomenon, the American sitcom family – an extraordinary legion who have cut a wide swathe through U.S. and world culture for several decades. The long strange trip continues as sitcoms confront bizarre new enemies like the one-eyed Quayle and the pre-historic President. What is the message in these conflicts and to what as yet undreamt of worlds will Homer lead his people?



HOMER SIMPSON ©2005 FOX FILM CORP.

ioned ideal of family life, he can only explain himself in terms provided by the powerful cultural technology that changed family life forever.

Before radio and television, the family home was a space which could function in relative seclusion from public life. In the advice manuals of Victorian times, the ideal middle-class home was one that sheltered women and children from the evil influences of the public sphere. The virtues of thrift and self improvement – the sort of values Bush associates with the Waltons – were a 19th century notion of the good life. In this vision of the family, men worked in the outside world and had the final say at home; women were to be protected from the outside world but managed the day-to-day business of the home and the raising of children. Of course, things were not like that for many people, but this was the ideal that the home manuals prescribed.

Every good middle-class Victorian home aspired to owning a piano, and women had to learn to play it and teach the children to play also. The piano was a civilising influence, supposedly. With the rise of consumerism, however, all this began to change. The piano was replaced by the phonograph, the radio, and finally the television. The virtues of thrift and self-improvement gave way to consumerism and the pursuit of leisure for its own sake. Conservatives have always decried these changes and called for a return to the old ways, but modern capitalism depends on its consumers to keep going.

Without this shift in family life from thrift to spending and from self-improvement to consumption, the industrial age might never have kept going. Indeed, the collapse of the economy that produced the return to thrift and discipline exemplified by *The Waltons* TV family happened in part because consumerism didn't quite take off in the '20s. It was only after the massive expansion of manufacturing that took place during the war and the deliberate efforts to turn war production into consumer production that the conditions were set for the kind of TV family we know today. The '50s saw a tremendous boom in housing construction. Young couples who had put their lives on hold during the war got into home-making with a vengeance. The period of suburban ecstasy had begun.

One of the new consumer technologies which filled the new suburban homes was the television. By 1955 about 65 per cent of American homes had one. Like all new media technologies, it began by reproducing the popular fare of the media it replaced. Just as the early gramophone records were reproductions of popular music hall tunes, early television reproduced popular radio shows. This is the first phase

of any new media – when it borrows and adapts the formats of the old media. Not all popular radio programs successfully made the transition to television. *Father Knows Best*, a well-known TV situation comedy of the '50s, was one program which did survive the transition from radio to television. Interestingly, the 'ethnic' radio sitcoms like *Amos'n'Andy* and *Life with Luigi* did not. The general public would listen to, but not watch, minorities on television.

Father Knows Best is typical of early American TV families. Its name sums it up and reveals how different it is from *The Simpsons*. Homer Simpson usually hasn't a clue what is best for his family or for himself. He is a figure of parody rather than an ideal image. But then, the postmodern TV families who are watching all this do not have the same expectations as the families who were watching *Father Knows Best* in the '50s. For one thing, they know a lot more about television than their '50s predecessors. The viewers of

The Simpsons have a much richer understanding of the history of TV sitcom families, and its producers know it. No episode would be complete without a handful of references to other TV shows, past and present. If *Father Knows Best* is TV in the first phase of optimism, innocence and adaptation, then *The Simpsons* is TV in a late phase of quotation, exhaustion and cynicism. In a stylistic sense it is certainly 'decadent', but that doesn't mean it is harmful.

This helps explain why someone like George Bush should criticise a show which most of its viewers think is a pretty funny parody of TV family life. The way people watch TV has changed. TV now has a history. The average middle-aged TV viewer can spot the references in *The Simpsons* to dozens of shows from *Father Knows Best* to *The Flintstones*. Younger viewers catch all the in-jokes about contemporary media, like Arnold Schwarzenegger and *Teenage Mutant Ninja Turtles*. By talking about the media knowledge of two generations of TV viewers, *The Simpsons* succeeds in uniting them together as an audience, and thus pulling in enough ratings to keep running. The only audience this excludes is the George Bush generation.

George Bush may be the last of the war-era, pre-TV presidents. Ever since the famous Nixon-Kennedy TV debate, candidates have had minders who understand television, but now many voters demand a leader who belongs to the same popular culture they do. The Clinton campaign theme song is Fleetwood Mac's 'Don't Stop Thinking About Tomorrow'. One can't image Bush being comfortable with that!

A successful presidential candidate, like a successful TV producer, is someone who manages to create messages that

The viewers of 'The Simpsons' have a much richer understanding of the history of TV sitcom families, and its producers know it.

The Simpsons is TV in a late phase of quotation, exhaustion and cynicism... it's 'decadent' but that doesn't mean it's harmful.

will work for a wide variety of audiences simultaneously. Before the age of national media networks, entertainers and politicians alike could vary their message to suit different audiences in different places. In the broadcast media age, the same message has to work for very different people at the same time. This is why both politics and entertainment can, at first glance, seem rather vacuous these days. Just try creating a story or an image that will work for millions of very different people all at the same time that offers anything more than "a thousand points of light". *The Simpsons* succeeds in this postmodern media art – and perhaps George Bush could benefit from a few tips from its creator, Matt Groening and his colleagues.

The credit sequence of *The Simpsons* shows the family racing home from their various activities to watch TV. They all zoom into the living room, turn on the TV and watch *The Simpsons*. This is appropriate, because it is a TV show which is mostly about TV culture itself. To the TV literate viewer the credit sequence is rich with quotations from



FATHER KNOWS BEST

Shooting Star

other TV shows. For example, the *Dick Van Dyke Show*, which started with the family arriving home together, including Van Dyke coming through the front door and tripping over the ottoman. In later series, Dick comes through the front door and avoids tripping over the ottoman – an early example of TV referring to itself and moving into a decadent phase. Likewise *The Simpsons* intro has little changes every week for the alert viewer. *The Flintstones* – another show *The Simpsons* quotes from freely, always started with the family going to the drive-in. Where the 'modern stone-age family' went out for the evening, the postmodern 'neolithic' family in *The Simpsons* watch TV. The show even features a cartoon within the cartoon, called the *Itchy and Scratchy Show*. This is a cat-and-mouse show which pays homage to the master of character animation, Chuck Jones, who produced the best episodes of the *Bugs Bunny Show*.

Appealing to the media literacy of the audience is one way to generate interest. The average lowbrow TV viewer is not a cultural dope. He or she just knows and understands different things to your average 'middlebrow' intellectual. In particular, people know about television, especially if they grew up watching it. Appealing to the common education in the forms and histories of TV is one way to make successful TV.

Yet this doesn't solve the main problem which TV producers share with politicians. How do you make the same message work for millions of people at the same time?

One way is to appeal to the common values that the bulk of the audience is likely to have in common and ignore anything divisive or controversial. This was the formula for *I Love Lucy* and *Father Knows Best*. They assume that the values of a middle-class, white suburban family are the norm. In the case of *I Love Lucy*, these values are upheld in the negative. Irish Lucy and Latino Ricky can perform their comic antic deviations from these basic values because they are a bit 'different'. They always come back to the norm in the end.

Of course, even these very straight-looking '50s shows are not without their deviant sides. Lucy is always plotting and scheming to undermine the authority of her husband. While Ricky always triumphs in the end, the show does nothing to

discourage female viewers from identifying with Lucy and hoping she wins out one day. The popularity of these old shows today in cable re-runs may have something to do with

The idea that the white middle-class family was the norm might have worked in the '50s, when it was mostly white middle-class people who owned the TV sets, but it stopped working in the late '60s.



Shooting Star

THE DICK VAN DYKE SHOW

this kind of devious re-reading of the possibilities lurking just below the surface of the normal, '50s sitcom. The idea that the white middle-class family was the norm might have worked in the '50s, when it was mostly white

middle-class people who owned the TV sets, but it stopped working in the late '60s. A more diverse TV audience, tuning in to more conflictive times could not be so easily satisfied.

The answer was a new kind of sitcom, pioneered by Norman Lear. In *All in the Family* and other Lear shows, the conflicts within the TV audience are more directly dramatised on the screen. TV no longer has a clearly identifiable moral centre-ground. The character of Archie Bunker – an obvious model for Homer Simpson – is the classic example. To conservative blue-collar viewers he was the hero of the show. To liberal, educated people he was the butt of the joke.

TV producers learned two things from *All in the Family*: that different sections of the audience can hold quite opposite views about the same character, and that the show can dramatise the conflict between their views. *All in the Family* was a remake of the English comedy *Till Death Us Do Part*, and pushed even further its premise that the conflicts between men and women and between the generations

within a family setting can make for great comedy.

Happy Days, the late '70s hit that edged out the late '60s style confrontational comedies, changed the rules once again. In an era weary of conflict, *Happy Days* relied on nostalgia for the '50s when life was simpler and everyone got along nicely. *Happy Days* wasn't quite the '50s of *Father Knows Best*, however. The character who 'knows best' in *Happy Days* is the Fonz. With his leather jacket, greased back hair and motorcycle, he was a domesticated version of Brando's character from *The Wild One*. No longer an image of the bad boy outsider, he was now the outsider who uses his detachment to lend a hand to the TV families of *Happy Days*. This is not the real '50s but the '50s of TV memory, a cut-up of all the TV images of the '50s, all spliced back together in a comedy format. Here, the once very separate worlds of rock'n'roll and prime-time TV are cut and mixed together.

The *Simpsons* cuts and mixes images of TV families from all eras. The long-haired school bus driver in *The Simpsons* is a cartoon version of the Fonz. *The Simpsons*, therefore, encourages different kinds of viewers to identify with the different characters, and it borrows those characters from many other shows. Its stories vary enormously depending on the writers and producers. Some are lovingly copied '50s style stories of suburban normality. Some are radical postmodern '90s style parodies of same. Some are conflict dramas, some are morality plays of the kind popularised by *M*A*S*H*.

The changes made to the stock material of the sitcom in *The Simpsons* are instructive. Homer has a desk-job at the nuclear powerplant. He is not a blue-collar worker like Fred Flintstone or Archie Bunker. The female characters are more fully developed than Wilma Flintstone or Betty Rubble, and get story lines of their own. Female viewers are encouraged to identify with post-feminist female characters who stick up for themselves and take an active role in many situations.

While Bart is famous for his non-committal attitude to school, sister Lisa is a diligent student. Young viewers can identify with being cool or being smart. Middle-class parents who value good manners and education can identify with Marg and Lisa; while Bart and Homer uphold a traditional working-class idiom of a rebellious youth followed by a conformist, non-confrontational middle-age.

While *The Simpsons* is a perfect example of a successful TV show which appeals to a wide cross-section of the broad-

cast TV audience, it may also be the end of an era. Now that America has entered a post-broadcast TV age, the rules of TV culture are different. In the broadcast era, TV had no history.

Once shows were cancelled, they disappeared forever, or were banished to the netherworld of late night re-runs for chronic insomniacs and shiftworkers. In the post-broadcast age, cable TV resurrects all manner of TV families in regular viewing hours, making a TV a smorgasbord of TV archetypes.

The tendency of contemporary shows like *The Simpsons* or *Twin Peaks* to quote so much from TV history reflects an audience with much wider experience of the history of TV than in the past.

The combined budget for new programming that the cable operators wield is now greater than the combined budgets of the old broadcast networks. The broadcast networks are losing their audiences to cable, and securely retain only the 'Bush generation' of senior citizens and the American underclass of poor black and Hispanics. Cable TV audiences are smaller but richer, and programming may increasingly try to zoom in on the specific tastes of particular audience segments, rather than trying to appeal to a combination of different cultural values held by disparate groups. Meanwhile the shows themselves are now rarely 30-minute narratives and are increasingly

made up of 5 minute between-the-ad-break bites. *China Beach* and *L.A. Law* are typical of this kind of cable era TV which assumes that viewers are zapping around 53 different channels in a vain attempt to find a minute's worth of something interesting.

Compared to those shows, *The Simpsons* looks positively nostalgic. Not nostalgic for another time, but for the old style of television, where one story about a family member would be told over the whole half hour, and the audience would follow their dilemma through to the end. The postmodern, post-broadcast audience, by contrast, hits up on a short bite of the show, then decides whether to flip the remote control – perhaps back to some '50s re-run.

Fragmented audiences, fragmented shows, fragmented TV culture. It doesn't make a politician's job any easier. George Bush may be nostalgic for *The Waltons*, but it won't be long before politicians are nostalgic for the TV culture of *The Simpsons*. But by then Bart Simpson will be President of the United States. ●

McKenzie Wark lectures in communications at Macquarie University and writes for the Higher Education Supplement of *The Australian*. His last story for *21•C* was on technology and the military-industrial complex.



It won't be
long before politicians
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A Date with Density



Before overpopulation forces us onto other planets and into space stations, our satellite cities will become linked with State capitals. But will this chaotic suburban sprawl lead to L.A.-like cultural ghettos, unbearable concentrations of high-rise buildings and an inevitable breakdown of public infrastructures? Alternatively, will careful planning solve these potential problems and create the well-structured and smoothly run zones needed for a vital culture and comfortable living?

Roland Fletcher

(shown here with Sydney skyline) is researching the growth patterns and the threshold levels of ancient cities, through to theoretical predictions about cities of the future. As he emphasises, exactly what will happen to each city cannot be predicted. However, what will tend to affect how cities grow or cease to grow can be suggested.

Robyn Williams talks with the University of Sydney's senior lecturer in archaeology. ►



JOHN GOLLINGS

ANDREJ LIGUZ

Robyn Williams: *Tell me about cities. What made you first decide to study what was going on in their growth?*

Roland Fletcher: The irony is that I didn't! I started off studying very small settlements. I was looking at settlement growth over the last 15,000 years, trying to see if there was some pattern to the rates of growth and also, in recent times, at the maximum residential densities in settlements. I only got onto cities as a result of that.

What made you expand to cities?

The work on maximum residential densities started to produce the surprising result that overall residential densities in villages and towns could be very high – up to 400-600 persons per hectare. In large cities the maximum, overall densities can be as high as 250-350 per hectare. These densities appear to be an upper limit on the way human beings can organise themselves. So they represent a limit beyond which social interaction does not appear to work. Then I began looking at the figures for the areas of cities. What became apparent was that compact pre-industrial cities had a maximum size range of somewhere between about 70 and 100 sq km, though most were less than 20 sq km in extent. The smaller ones could persist for long periods of time but the very large compact ones rarely lasted for more than 300-500 years. The growth of a community can be plotted on a graph of residential density and community size, that is, the number of people in it.

How far back did your research go? To the beginning of cities, like Jericho?

I wouldn't class 9th millennium B.C. Jericho as a city – a very scruffy little place! Two to four hectares – nothing much. People in different regions of the world call their settlements 'large' according to their own regional perspective. Europeans talk as if their cities were big. They have been since the mid-19th century, but before the Industrial Revolution they were actually quite small by Chinese standards. 'Million-sized' cities only got going in Europe in the 19th century, whereas there had been million-sized cities, like Ch'ang-an in China, since the 9th century A.D. The Chinese have been carrying the biggest cities on Earth for most of the past 3,000 years.

So I was beginning to get interested in methods of comparing settlements from all over the world. That started to have implications for understanding modern cities and for what is concerning me now, some rather worrying long-term implications for the cities of the future.

What are the implications that are bothering you?

If the model I'm working on applies to the future, we should be able to roughly predict the maximum densities, maximum populations and maximum settlement areas of future cities. And it's a bit odd to be able to sit here and argue that you might be able to work out what the sizes of our future cities could be – their maximum operable sizes at different densities – especially the contrast between compact and dispersed settlements.

I remember living in London when they said it was the largest city in the world, with about 9 million people. It was regarded as gigantic, and growing larger than would be possible to cope with. Now we've got Mexico City at 21 million – 3 million more than the entire population of Australia! And one

assumes that crushing people together is something they learn to cope with. Are you suggesting that those large ones are going to break down?

Not for a while. Let's go back a step and look at pre-industrial cities. Over the last 5,000 years the maximum size of compact cities has gone from about 1 sq km to 100 sq km. They did that using a basic assemblage of recorded information – writing, bureaucracies, state organisation and various methods of moving resources: portage in Meso-America; carts in Mesopotamia and China. So the implication is that on any given suite of communication systems, compact settlements can grow roughly 100 times in size. The same basic com-

munication systems and transport are just elaborated as you go along. The size limit is the areal extent at which communication systems no longer work adequately.

Since modern industrial cities really took off from sizes of over 100 sq km in extent – on variants of the systems that we now use, such as mechanical printing, electronic communication derived from telegraphs and engine driven transport – we should also be able to run cities, compact cities which are at least a 100 times larger, that is, around 10,000 sq km in extent. That's the entirety of the Cumberland plain, everything from Wollongong to Newcastle and inland to Katoomba. With Tokyo, that's the entirety of the Kanto plain, including Yokohama to the south. So those are the sorts of areal extents we could get. And if you're running such giants at densities of say 100 persons per hectare, you're dealing with 100 million people. According to the model, there is no behavioural reason why, within our ability to tolerate interaction, that shouldn't be feasible, given the potential capacity of our existing systems of communication.

It sounds appalling.

Whether you'd like it is another matter altogether! But the implication is that it would be workable.



15th Century Florence.

**Before the
Industrial
Revolution
European**

**cities were actually
quite small by Chinese
standards where there
were million-sized cities
since the 9th century.**

Well, I know that getting into the centre of Tokyo takes over two hours, and an immense amount of money, and you hardly see a tree as you go. And, even for the small size of the average Japanese person, the dwelling places are tiny.

And what we're perceiving is that these places are becoming more and more expensive to run. For instance, Los Angeles had previously planned to commit a huge amount of money to freeways, yet it has been estimated that in the year 2020 its traffic would not go much faster than it does now.

Seventy per cent of the land surface of Los Angeles is actually given over to the motor car.

That's right. To put this in perspective we need to look at the greatest pre-industrial cities like Baghdad, Ch'ang-an and Edo (Edo was the predecessor to Tokyo). We find two quite interesting things. First of all, they were the centres of enormous empires or strictly controlled economies. In other words, if you wanted to run a huge city of 90-100 sq km, you needed most of China to do it. You had to control the resources, especially from the Yangtse, and bring the grain up the Grand Canal to you. So if we're going to have very large cities in the future, they may have to expand their dominance of the world's economic system in order to keep themselves going. Second, we tend to think of giant, future cities as quite appalling but

their predecessors were also major centres of great artistic achievement. You know, the great graphic art of Japan came out of Edo. In the future some of us may well consider our giant cities to be wonderful cultural places. And the real poverty may be far away out of sight.

Mark Cohen makes a marvellous point in his recent book *Health and Civilisation*. When you had cities of the size of Imperial Rome, the very poor lived a couple of blocks down the street. Now, in the modern city, we still think of "our poor" as living in a nearby suburb. But on the scale of the world economy, what Cohen points out is that our poor are also the people in Angola, and in the backblocks of Brazil. We have got to think on a planetary scale. Our slums are not just in the streets nearby. The real poor of the industrial world are a long way away. So we need to change the entire scale of the way we look at the system, and it's the sheer magnitude of the thing that begins to worry me – especially when you envisage that you could have 100 million people living in a city of the near future. How Australia would carry one, Heaven only knows!

On the other hand, especially

in American cities, the poor live in ghettos which are no longer close to the places of work. In the old days, the poor used to live, say, in New York, and they'd have a pretty miserable time in the ghetto but nonetheless there was, sort of, a social culture. And the factories weren't terribly far away – even if they weren't hiring all that much, they might one day. Now, people are nowhere near the factories, the places of work, and they can't get out. They are trapped.



We tend to think of giant cities as quite appalling, but their predecessors were centres of great artistic achievement.

Two worrying things are happening in America. One is that everybody, not just the poor, is ghetto-ising. This is a key feature of Los Angeles, and one of the factors involved in the recent trial that sparked the riots – the trial was moved to an area residentially dominated by the Los Angeles police. The other one, of course, is that as the largest American cities get bigger, what they're actually doing is dropping to very low densities. This is the other great trajectory that we also see in pre-industrial cities, for instance among the Maya of Yucatan between the 3rd and the 10th century A.D. The modern American cities are dropping towards low overall densities. It seems that if they're going to keep on with unconstrained expansion they have to shift that way. The 10,000 sq km region around New York is already at a density of only 10-15 per hectare. To do that, what happens is that as the outskirts expand, the middle of the city starts to die. Now, in different societies it occurs in different ways. In the United States it happens because of capitalist conversion; by putting office blocks in the middle, while the manufacturing system dies. Of course, a lot of people are left high and dry. Could this be avoided or managed better? It may be a trend that is hard to reverse. Pre-industrial low density growth also provided very extensive cities, larger than the 100 sq km maximum for compact cities. This kind of

growth only seems to be possible at very low densities – perhaps modern cities will follow a similar track to very low densities and become far larger than 10,000 sq km. At high density, a large settlement area would severely strain the communication network, so dropping to lower densities may be a way of reducing interaction and communication stress in very large cities.

There's one problem in all of what you say, given present circumstances, and that's Hong Kong, which has very dense living and seems to be a success.

It's small by industrial standards – only a few hundred sq km, if that. The continuous built area of greater New York is now more than 7,000 sq km. Housing and built urban land in Sydney covers somewhere around 2,000 sq km. It's quite hard to estimate exactly how big these places are – so rounded estimates are a wise precaution. Hong Kong is interesting. In the 20th century it has been bouncing along the density limit, moving down toward a range of about 300-400 per hectare for its overall density. What I would expect Hong Kong to start doing, once it gets over, say, several thousand square kilometres in extent, is to really start spreading out across the landscape and dropping in density. Given its impending resumption into China, this is now going to be a more likely pattern. Hong Kong could simply resume the entirety of the New Territory (1,000 sq km) as a solid urban area because its hinterland would then be China.

The thing to watch very carefully with cities, now, is their areal extent in relation to their overall density. If we can bring the growth of our cities in Australia under control, we've quite a lot of leeway and therefore face some rather complicated choices. The urbanised area of the biggest city, Sydney, is only in the lower third of the size range behind the predicted 10,000 sq km size limits and at quite a low density. Most cities and most settlements in the past have resided in the lower third of the size range behind their maximum settlement extent. And that seems to be where places are reasonably workable. If we allow Sydney to keep on growing, however, it won't be long before we start to move into much larger size ranges. Industrial cities can grow at rates of 5,000 sq km per century. What we do have to realise – and this is one of the positive things that the past tells you – is that it's perfectly feasible to keep city sizes under control. Interestingly enough, Europe, prior to the Industrial Revolution, did just that. European cities were generally quite small. Most were less than 10-20 sq km. It is quite feasible to have social growth, technological development, massive cultural expansion, and still keep city sizes under some

kind of control. There's an obvious historical example that it can be done. We just think it can't be controlled.

What do you think could happen if the worst took place in the various cities around the world?

The worst scenario is that up to now, even in the very early stages of the growth of industrial cities – only 200 years – we've already been consuming a huge amount of resources. Now what this means is that, on the model I'm arguing, we've consumed a vast amount of resources just to get most cities into the lower third of the possible range of areal extent. As you look at the economics of pre-industrial cities, the costs increased astronomically in their middle and the upper size ranges. The worrying phenomenon would then be that in the future we could be consuming far more

resources than we already have, just to enable fewer and fewer cities to become bigger and bigger. In other words, while we are simultaneously arguing that we have to start controlling our use of resources, if we let our big cities go on growing, their cost is going to go up exponentially – not merely proportional to their size.

Out of control.

Out of control in two ways. First, the extreme cost of

very large compact cities. Second, the expansion of very big cities that drop to low densities. Once they get, say, to areas of about 10,000 sq km, with overall densities of 10 per hectare or less, they will simply have no behavioural constraints on their expansion. There does not appear to be a cultural constraint on the extent of very low density settlements. But conversely their communities never seem to recover from that trajectory. They remain in it, do not seem to display a capacity for adjustment, and eventually cease to function.

What would this out-of-control situation look like? Death in the streets, or what?

Not necessarily and not initially. What we should bear in mind with the social problems in cities is an analogy to putting stress on the human body. If you over-stress two human beings, one may die of a heart attack and the other of a stroke or something else. The same stress can pick out different weaknesses. The problems that arise are contextual – each society will play out its stresses in a different way. I'm quite sure, for instance, that Sydney won't do the same sorts of things as Los Angeles, because it simply doesn't have a racial mix on the scale of Los Angeles.

What is generally expected is that low density settlements will continue to splurge across the landscape unless we do something about them. So we will get more and more of the 'periphery cost' problems that are being discussed for



Left: Contemporary Hong Kong.
Below: Hong Kong street scene c1870.



"There is no behavioural reason why, within our ability to tolerate interaction, (a city of 100 million people) shouldn't be feasible, given the potential capacity of our existing systems of communication."

A future metropolis proposed by the TASEI Corporation (Tokyo) to promote the concept of a viable underground city.



Sydney at the moment. Cities will expand into an irreversible, low density trap. In America, for instance, there would be a continuous dispersed urban system from Boston in the north to Washington in the south and probably extending inland to the Great Lakes and linking up with the Chicago-Gary complex as well. In Australia, the risk would be a continuous scatter of buildings from Wollongong to Brisbane. The numerous subsidiary centres may then begin to provide opportunities for ghetto-ising.

With enough resources such vast cities could be run quite well – for a while. But the pre-industrial giants seem to have been very vulnerable to changes in their political and economic milieu. When, of course, we start running out of resources, for whatever reason, presumably we will begin to



ENTERING HOUSTON, TEXAS

In America people are moving out. You're getting migration from places like New York and now away from California to new urban centres.

find severe failures in the maintenance of infrastructure, such as sewers, roads and bridges – which American cities have suffered for more than a decade. Presumably, also, problems of deprivation, social deprivation. We need to start looking at models of critical collapse. But you would have to go to the sociologists and the regional historians and the regional specialists to work out what those weak points would be in any particular culture.

If we do take heed of what you and others are saying, and seek to put things right, how might it be improved?

At the moment, for Australia, keeping the areal extent of our large cities roughly where it is and increasing the overall densities – residential densities are generally low – would give us a lot of leeway to work out what to do. Incentives to live at higher densities are required so that we avoid the very low density trap. We will also need to ensure that the cities of the eastern seaboard do not link up. Our advantage is that though sorting out solutions is not going to be easy, as the recent report of the House of Representatives Standing

Committee for Long-Term Strategies makes clear, we have got some time to do it, provided people have the nerve to try and not say: "Oh, well, we'll worry about that problem later, when it is more urgent". Then the problems will be really intractable.

So in Australia, if we're sensible, we're going to have to go in for very high-rises, and perhaps even underground?

Oh, not necessarily. Our big cities are operating at extremely low overall densities – somewhere in the 10-40 per hectare range. And we don't have to have the same arrangement everywhere within one city. You could have far more people in the middle of Sydney, for instance, high-rise in the middle, – medium density at least. High-rise usually works for people who will spend considerable sums of money to have their lifestyle functional in that fashion. We know that high-rises on low budgets tend not to work all that well. We will need to gradually fill in our cities rather more – probably more than is usually envisaged – and provide more facilities for people. The additional obvious strategy in Australia is that we have a large number of attractive, relatively small towns out in the country, and they could really profit from many more people, more industry, more service support. Migration out from Sydney would slow its growth. But the problem is – just think in terms of young people – you've got to simultaneously provide discotheques, cinemas and jobs.

But you've got the countryside all around them as an attraction, surely.

Indeed – if that's a real attraction. The problem is that I think cinemas and discos are a more powerful attraction at the moment – and work is the powerful attraction. And how would you set up a deliberate policy of developing places like Bathurst and Dubbo and Wagga-Wagga, in such a way as to make them attractive for urban migration?

Yes, but, Roland, you won't have cinemas in a few years' time. That's a terribly old-fashioned concept. And a disco...? I mean, you can do all this on-line, can't you?

I'm obviously getting old! [Laughs] I'm quite prepared to have virtual reality thrown in as well. I think we'll probably be running with the cinema in some form for a couple of decades, at least!

What is happening in America is that people are moving out. You're getting migration from places like New York and now away from California to new urban centres. And one of the things that's always impressed me in America is the level of municipal cultural enterprise that you see. You go to Wichita in Kansas, and it has a philharmonic orchestra, which I heard a couple of years ago, and was very impressed. And an enormous theatre... It's plainly possible to do these things. Whether we've got the will to do it, or whether we can think of a strategy that will put resources out into our smaller towns rather than either create new towns or bunch them around the big capitals, is then a matter of political nerve and social planning. ●

Robyn Williams is the Chairman of the Australian Commission for the Future and executive producer of ABC Radio's Science Show.

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SEX SENSOR



TERENCE HOGAN

The notion of pornography in a period of information technology will create censorship battles far beyond that of the accessibility of videos and magazines. The 'obscenity' charges inspired by Madonna's *Sex*, Ice-T's *Body Count* or Bret Easton Ellis' *American Psycho* will pale in comparison to the accessibility of electronic porn – for how does one wrap digitalised information in clear plastic with an R-rated sticker? DARRYL RIBAUX REPORTS ON THE SEX INDUSTRY OF THE FUTURE.

New and developing technologies in the telecommunications field and the availability in the home of hardware that was once out of reach of the average consumer are changing the ways in which people distribute and consume sexually explicit material. The speed with which developments are occurring is quickly turning what were fantastical possibilities into present day actualities. It is also creating scenarios that will rapidly prove too difficult for our existing moral, regulatory and classification codes to deal with.

Sexually explicit material – be it pornography or erotica – has always been big business. Those that make money out of the selling of explicit sexual representations have not been slow to utilise the new possibilities technology brings.

In the early '80s, new video technology placed millions of VCRs into Australian homes, closely followed by an explosion in the marketing and distribution of pornographic or erotic video material.

Before the advent of the VCR, people had to make a decision to go to a restricted arena such as the cinema to view pornographic or erotic films. Videotape made it possible to view film porn in the lounge room and in turn, led to fears that the new technology would enable children to access such material.

The VCR also shows us the difficulties that will be inherent in trying to control sexual material distributed via new technologies. Legislation was enacted to control, classify and, in some instances, prohibit certain material. But while this may have taken 'hardcore' material out of most Australian video shops, it is still possible to gain access to it by mail order – and if parental responsibility is abrogated it is also possible for children to view it.

The telephone line, one of the most important and pervasive technologies of modern culture, has increasingly become an instrument through which sex can be consumed – especially with the development of digitalisation.

Private telephone lines have been used for some time to offer sexual 'experiences'. In this guise the phone-sex on offer is interactive. You ring a number and invite somebody else into your fantasy world. Although the interchange takes place in 'real time', the

participants meet each other in a kind of psychological nether-world – the daydream as virtual reality.

This escape from the physical world can make 'phone-sex' a liberating, seductive experience for the user who is spared the manifold complexities of acting out their fantasies physically. Beatrice Faust, author of *Women, Sex and Pornography* says: "on the phone, you can exercise a great deal of risk in the absolute certainty that you are safe".

Safe from whom... and do you still feel safe after you have put the phone down?

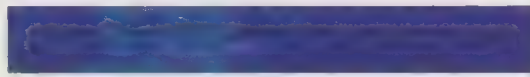
The other major phone-sex service currently available is the recorded message. When Telecom Aus-

tralia (now AOTC) offered private message services through its 0055 line, they were quickly seized upon, (as were similar services world-wide), as a means to distribute a variety of sexually explicit material.

In Australia, community concern over the content of such messages and the evident possibility of children gaining access to them eventually led to the formation of a Senate Select Committee on Community Standards Rele-

vant to the Supply of Services Utilising Telecommunications Technologies. The committee produced a report that considered and made recommendations about the content and classification of the new telecommunications technologies. It recommended that services providing recorded messages with a sexual content be restricted to the 0051 line and have a sexual content no more explicit than that allowed in an M-rated film, with access dependent upon a PIN number available only to those over 18 years of age.

But while pre-recorded services, (at least those offered on networks controlled by Australian telecommunications carriers), can be classified and regulated, 'live' or 'real time' phone-sex services cannot. The Chief Censor of the Commonwealth Office of Film and Literature Classification, John Dickie, says: "there is nothing you can do to pre-classify those sorts of conversations". The endless number of possible responses in an interactive phone call make any attempt at



Sexually explicit material, be it pornography or erotica, has always been big business. Those that make money out of the selling of explicit sexual representations have not been slow to utilise the new possibilities that technology brings.

classification a nightmare. Once someone has spoken, the material has been transmitted, and unless taped, evidence of it is lost. Any attempt at regulation would require the monitoring of known live sex service providers – an expensive and time consuming activity.

Is the community prepared to decide what people can and cannot say to each other over the telephone? One of the essential constructs of the fantasy world is its lawlessness. Can our unrestrained and ingenious flights into fantasy worlds be policed in a society where the primary sources of images and text will be almost impossible to trace?

Developments in 'Home Entertainment' technologies that are already with us, but not yet in every home, may also become the sites of sexually explicit experiences. The home video camera is relatively cheap and anybody can use it. The introduction of camcorder technology as a consumer item into the homes of many people has led some beyond the thrill of filming little Johnnie's first steps. It has brought with it the possibility of making X-rated home videos.

According to one recent report, there is already a large market in the U.S. for pornographic home movies (about a quarter of the X-rated video market), with people distributing their amateur videos through rental networks. Technology is giving many the option to participate in the making of pornographic or erotic material. It might be argued that this 'amateur' porn will undermine unrealistic images of sexual attractiveness and activities by positing a new aesthetic in which 'ordinary' people are seen as desirable. Of course, another interpretation is that any increase in the sources of pornographic material can only inflate the numbers of people who are exploited.

Such arguments are simplistic touchstones which barely begin to address definitions of the pornographic or the erotic. Any act of speculation about the effects of technologically mediated sex upon society must be built upon shifting grounds, acknowledging at once a wide range of moral imperatives and the wildly differentiated voices of desire and pleasure which can be heard within any society.

The criteria which can be used to distinguish terms of debate and identification are multifarious – in the 1990s, the sex industry moves around artistic, legal,

and ideological issues, to name a few.

With the advent of the video phone, the obscene phone call could take on new and frightening dimensions. Just what will you see if you forget to screen the latest incoming call? Given the ingenuity with which new technology has been used to distribute material of a sexual nature, it is not too hard to imagine the uses to which video-conferencing could be put. A person may be able to participate in a two-dimensional orgy with people all across the world.

The new integrated services digital network (ISDN) technology allows integrated voice, text and image to

be transmitted via a single digital connection. While such a service has only limited availability now, AOTC envisages a time when it will be available to the average household. Even more possibilities for those with a fertile imagination.

Pay-TV – coming to Australia very soon – is already a vehicle for the transmission of sexually explicit material in the U.S. Debate is already occurring in Australia as to the nature of material that subscribers

will be allowed to access on the new networks. This debate clearly illustrates the difficulties in addressing the possibilities new technology is creating. The aforementioned Senate Select Committee has recommended the proscription of X-rated material on Australian Pay-TV, with access to R-rated material only possible if a subscriber has a PIN number. However, some legislators have raised the prospect of banning R-rated movies from Pay-TV as well, creating the situation that what you can get from a video shop and watch in your lounge room, you will not be able to receive on a subscriber service – even with restricted access.

Will consumers eventually have access to satellite receivers which will enable them to pick up Pay-TV from Hawaii? The Department of Transport and Communications told the Senate Select Committee: "Within the next five years there would be four or five foreign satellites capable of beaming into Australia onto the small home receiver dishes. Australian ability to control those satellites and the material carried on them is almost nil...". If individuals had the money and desire to access such material, "there was basically



With the advent of the video phone, the obscene phone call could take on new and frightening dimensions. Just what will you see if you forget to screen the latest incoming call?

nothing Australian authorities could do about it".

If new technologies capable of regulation are put in place, at what cost and how effectively?

While 'virtual reality' throws up the most colourful scenarios (will you be able to have sex with a simulated image of your favourite movie star? How will copyright be enforced?), the computer – the site of these possibilities – is already providing spaces for the distribution and consumption of sexual material.

Colour images scanned from pornographic magazines are available via the bulletin boards of special interest groups on computer networks. In other countries, subscriber services exist that provide sexually explicit products. An Australian company previously offered such a service but closed it in April 1992 due to lack of subscriber interest. The problem seemed to be that people who wanted to, could get such material free of charge.

If desired, adults-only software can be purchased. Arcade-like games offer, as one advertisement proclaims: "sexual preferences and foreplay options; play with two to eight [yes, eight] close friends in 'true sound'; five mb of action". And for more sex for your disc dollar there is the increased storage capacity of CD-ROM.

Of course the regulation of these software components may be possible. They are concrete, have to be distributed and can be used as evidence in court – although given the ways in which pornographic books and film found their way into people's homes, it seems highly unlikely that there would be much success in stopping the flow of such material on computer disc into the country. It should also be remembered that they are relatively cheap and easy to copy.

But while concrete formats may provide avenues for some type of regulation of computer generated sex, the new technologies have provided other media for the distribution of sexually explicit material. Material can be transported through the ether. Before, a society could put gatekeepers in place, like customs officers, to stop the flow of illicit and illegal material. But how do you censor binary stream stuff – sex coded as bit pieces, relayed through space and time, and into the loungeroom via satellite or fibre-optic cable? You cannot open it up and take a look at it as you can a container of books or films.

One option may be to set up a body to scan the bul-

letin boards and special interest groups within the information networks for contraband. The problem with this is the volume of traffic and the size of the networks. Given the exponential growth of information networks, there was probably never really any chance for effective regulation. It is said of one network already in place that a new machine capable of acting as a service provider, (supplying space for a group to operate from), comes onto the system every 20 seconds. Nearly 200 per hour world-wide. And that is only within one network. Ample space to hide almost anything.

The ways in which this material is transmitted also

mean that even if regulation is attempted, nothing can be done until after the fact. Telecom Australia told the Senate Select Committee that while they could monitor their database services for unacceptable material, such material: "could only be examined by the database managers... after it had publicly appeared". In other words, after the 'damage' has been done.

The interactive nature of some technologies also poses

a problem: how do you classify something that has not yet occurred? As John Dickie says: "With computer games there are an endless number of possibilities given different commands into the machine in response to questions. In classification terms, that presents enormous problems... for anybody who was going to take it on because if there were 100 possibilities in answer to a sexy question or something of that nature, depending on what answer you gave, you'd go off down one track or down another. Depending on where that led it might be absolutely harmless; another might take you to sexually explicit solutions."

Even if a user doesn't have access to a network or service in Australia, he or she can always log on somewhere overseas (somewhere where sexual graphics are not regulated), via the telephone lines and information provided in computing magazines. All that is needed is a spare line, a modem and money to pay the costly telephone bills.

In the future it may prove impossible to regulate the flow of technologically mediated sexual material on the computer and telecommunications networks, and



'Virtual reality' throws up the most colourful scenarios — will you be able to have sex with a simulated image of your favourite movie star? How will copyright be enforced?

Policing Sex

In Australia, the most comprehensive attempt to address the legislation governing 'content' and telecommunications technologies has been the reports of the Senate Select Committee on Community Standards Relevant to the Supply of Services Utilising Telecommunications Technologies.

The committee was established as a response to concerns that the Telecommunications Bill (1991) did not specifically provide legislative coverage on the content of 0055 lines and videotex services on Telecom's network.

Its brief was to inquire whether the providers and carriers of telecommunications services should implement codes of conduct for services provided. The committee also considered how such services could be controlled as well as making recommendations as to the content of material provided via the telecommunications network, including the standard of material desirable on Pay-TV.

The committee's final report, which was tabled in parliament in May 1992, made several recommendations:

- X-rated material is not suitable for screening on Pay-TV;
- the Australian Broadcasting Authority (ABA) conducts research into community expectations in relation to content classification on Pay-TV and that until such research has been conducted, the standards of free-to-air television should apply rather than the classifications that cover film and video;
- Telecom and other telecommunications service carriers "enter into a contract with the Office of Film and Literature Classification (OFLC) for it to act as the monitoring and enforcement body for the code of conduct for videotex services".

In 1991 the committee's interim report recommended that Telecom formulate a code of conduct in regard to the services provided. 'Adult services' should be moved from the 0055 lines to restricted access 0051 lines. It was recommended that content on the 0055 lines be of the nature of the OFLC's 'G' rating, while the 0051 lines should have a content no

given that something like the camcorder enables what was once a blank video tape to become the carrier of X-rated content, it may be that the only option is to proscribe the possession of material the community has deemed offensive. However, this would give rise to a scenario more nightmarish than most virtual reality experiences could provide.

How worried should we really be? What elements of the pornography/censorship debate will be changed or challenged by new forms of pornographic consumption? Do developing technologies really open up the possibility of a flood of pornographic material? Maybe our society will consume the same amount it already does but through different media instead. John Dickie believes that as with X-rated videos, pornographic material, be it computer or telephone based, will be confined to a small niche market.

It may also be that the technology itself, will be an impediment to the acceptance of a more technologically mediated consumption of pornography. Faust says that while the interactive nature of some technology changes pornography on an ontological level, the

types of interaction available at the moment through computer games are childlike and simple. Most people would find them very boring. When asked whether people might respond differently if the interaction was of a more sophisticated nature, Ms Faust replies: "well

if you get to virtual reality they might... but if you think about a lot of entertainments, you know, 'feelies' and 3D films, people do not respond very well to those. They don't have a very long life. It's a bit hard to integrate human responses to technology. There really is a limit to how much a human being can interface."

Most people are not yet fully comfortable with developing technologies (especial-

ly the generations that did not grow up with them). This lack of 'sympathy', may be a temporary barrier to the widespread acceptance of technology as a site for the playing out of sexual fantasies and as a medium for the consumption of pornography. In fact mediums like virtual reality may only be successful if sensation, the



How worried should we be? What elements of the pornography/censorship debate will be changed or challenged by new forms of pornographic consumption?

more explicit than an OFLC 'M' rating. Telecom complied with the recommendations and entered into an agreement with the OFLC that assigned it a classification and monitoring role.

This agreement is the type of regulation that so far seems to be favoured by the Department of Transport and Communications – a system of indus-

The Broadcasting Services Bill proposed that X-rated material should be banned from Pay-TV.

try self-regulation rather than government legislation (although the department has said that if this approach fails, alternative methods will be looked at). The telecommunications industry regulator, Austel, does not see itself as having a message classification role. Amanda Davis, Austel's consumer affairs general manager, says: "content regulation is not anything to do with Austel. Austel is the industry's economic and technical regulator".

The Broadcasting Services Act (1992) provides for

the Australian Broadcasting Authority to enter into an agreement with broadcast providers as to the type of content that will be allowed on Pay-TV. This would be an agreement, not legislation. The original Broadcasting Services Bill proposed that OFLC standards be applied to Pay-TV (thereby allowing the broadcasting of R-rated material on a restricted user basis). The Bill also proposed that X-rated material should be banned from Pay-TV. The section regarding regulation of content has not yet been enacted and is still under parliamentary consideration.

There is no legislation regarding the transmission of sexually explicit material via computer networks although Telecom does apply standard conditions to contracts with its service providers. The Senate Select Committee recommended that material on videotex services should not be allowed if it "in any way may be interpreted as equivalent either to the X- or R-rated film/video classification, or to the Category 2 classification for literature", and that these standards should apply even to restricted user groups. As yet, there is no classification procedures for computer software. C

tactile dimension of interaction, can be duplicated. Otherwise all you would really have is some kind of glorified hologram.

Gradually, a new generation will emerge that takes these new technologies for granted and feels comfortable with them. For them, technological format may not be an impediment to a more 'comfortable' consumption of sexually explicit material.

One of the big fears that the computer based consumption of porn gives rise to is that it will create people who will mistake a seemingly three dimensional activity for a 'real' world experience. The question asked is: what if a person, who has only ever had 'disembodied' intimacy or has a conception of sex based on the giving of commands via a computer console, attempts to apply this type of interaction to a living, breathing human being? And will the interactive porn experience amplify the effects that sexually explicit material has on people?

Then again the boundaries between what is real and what is simulation, may not be so clear cut in the future. There could come a time when codes of moral conduct may have to be applied to our interactions with computer generated constructs.

While many people are concerned about child

access to these possible pornographic or erotic formats, it may be that some of these technological possibilities will enable new forms of sex education. Supervised computer simulations may in fact be helpful. Ms Faust argues: "a lot of people have fears about sex, and if you can distance them from the reality by showing them pictures or relating to something else, you can take some of the anxiety out of it. I can see a situation where just because it's a bit unreal, just because it provokes laughter and because you have got options – you can set it up in that binary form – it could be very creatively used for therapy and for sex education."

It is easy to be fearful of the scenarios that new technology may give rise to. But banal as it may seem, it is important to remember that the material distributed via these media are human constructions consumed by human beings. The material is a reflection and embodiment of human values.

Concerns about and attempts to control or regulate such material needs to address first and foremost, the question of why there is a demand for it. Blaming the messenger is the easy way out. ●



They know who you are. They know where you live. As a new century approaches, advertisers will know even more. Insidious as it sounds it will be the individual who willingly participates. You will want to tell them everything – surrender all information because it will better satisfy your needs. That is the scenario depicted by *Marketing* magazine's editor Michael Kiely. "People love to give out information about themselves," he claims.

While not everyone gets as excited as Kiely, the general precept held by many in the advertising and marketing industries is that direct marketing via new technologies will be the sales tool of the future, permitting closer relationships

Ray Edgar gets
sold on the new

technology of
advertising.

THE POWER OF ONE



between consumer and producer. The market segmentation that has already occurred will be fine-tuned to the ultimate one-on-one relationship. The segmentation down to one, the power of one.

● THE POWER OF SEDUCTION

Despite the proliferation of new technologies which have left much of the advertising world dumbfounded, the old chestnuts – sex, games and entertainment – will remain the tactical weapons in the advertising and marketing of future products, even the selling of the technology itself.

"You've got to have some killer application that's going to make the information technology (IT) viable," says Tom Forester, senior lecturer in communications at Griffith University and author of six books on IT including *High-Tech Society* (1987) and *Computer Ethics* (1990).

Forester, perhaps surprisingly, has a more cynical attitude to IT than do many advertising people. "It could be porn-led,"

he says, pointing out that sex has proven a major inducement towards public acceptance of technology, citing the launch of the interactive French Minitel videotex system.

In France it was pornography and dating that made Minitel viable, says Forester. "The videotex system was successful mainly because French Telecom supplied free terminals to every home. It acted as an electronic phone book because they were so incompetent at printing a phone book every year. They started running dating services – the French love to flirt and gossip – so it took off. In no other country has videotex been successful. Some argue the VCR only became successful because of the 'blue' angle."

When Forester advised the Gold Coast's Robina Shire on whether they should have fibre-optic cabling and link ups, he said they might be able to make things viable if they went for on-line prostitution or on-line gambling hookups to Jupiters Casino. The shire apparently did not think it was particularly suitable for a district dominated by retired folk.

"So what's going to be the killer 'ap' that's going to make these things viable?

"Things do come along – my message is not wholly negative," says Forester. But the reality is that R&D results can take up to 30 years until product goes into mass marketing. Faxes, for example, were invented in the '40s and fibre-optics were around in the '60s. However, one thing is certain, the world will go digital, making the prospect of a multimedia lifestyle all the more likely.

● THE MAX HEADROOM MARKET

In the film *Max Headroom* the perfect killer 'ap' is discovered. In a deadly strategy, a top-rating television station commissions a computer whiz-kid to prevent viewers swapping channels. The technique compresses a 30 second commercial into three second 'blip-verts' to discourage viewers switching channels during ads. The result is an overloading of sensory information on the brain causing a dramatic short-circuiting – spontaneous combustion in the more slothful viewers; old folks, couch potatoes, the sick and unemployed.

Thankfully this version of subliminal advertising, as the beginning of the film informs us, is 20 minutes into the future. Right now, the neglected group who got blown up in *Max Headroom* are using the more advanced techniques of shopping currently available.

For various reasons – often fear – pensioners are buying and shopping from home. The U.S. is leading the way with direct telecommunications marketing. The ability to order everything by phone (or in the future by multimedia systems based on

fibre-optic communication) is taking off specifically in the 'Max Headroom' market – the old and the unemployed.

According to Dr George Beaton, former director of global advertising giant BBDO (South Africa) and currently consultant and lecturer at the University of Melbourne's Graduate



Samples of artwork
from various Minitel
adverts developed by
McCann Interactiv.

School of Management, "Home shopping by fibre-optics or any other means is not going to grow as rapidly as the technology makes possible. People still like going out to work or to shop unless they have a reason not to go out, either because they are infirm or fearful. It is a trend driven in part by the ageing population and their increasing fear of going out in the cities."

Dr Beaton believes that while information technologies will allow the consumer market to be targeted specifically to the individual, the immediate need will be to influence people as close to the point of purchase as possible. Supermarket and retail outlet automation is already established and shopping from home is becoming more widespread. However point-of-sale advertising for the consumer who ventures into the store will present another exciting commercial challenge altogether. Holograms on aisles and videos on trolleys will continue to transform the supermarket into something of an enchanted forest – or at worst an irritating, though bewitching, demonstration of expensive production and technology.

● THEY LAUGHED WHEN I TOLD THEM ABOUT INFORMATION TECHNOLOGY

"Technology is giving us more and more opportunities to break through to clients," says McCann Erickson advertising's information and research manager, David McCaughan. Alongside their own extensive studies, McCann Erickson have employed Massachusetts Institute of Technology's Media Lab for extensive research into media futures and its advertising potential.

What drives McCann's philosophy is the issue of globalisation, encapsulated by the agency's major client Coca-Cola, the ultimate cross-cultural product. As companies continue to become global they must also be aware of local markets. In the same way that agencies are targeting individuals, their quirks and personalities, they also target the characteristics and utilise the traditions of various cultures. Everything, around the globe, it seems, can be dissected into 'marketable' fragments.

However, with the onset of new technology there are surprisingly few people even considering its potential uses. Attitudes to media technology in the current era have similarities to the '50s. Current attitudes towards IT of the future and the new forms of entertainment are akin to advertisers' often naive lack of confidence in television in the '50s. The 'highly charged' ideas emerging at the moment which match technology with advertising are a flaccid concoction of spon-

sored programs and advertising slogans at the bottom of multimedia screens.

For a supposedly 'creative' industry, most advertising people are decidedly conservative. They avoid predictions and contemplating an idea of the future requires more leaps of the imagination than selling products in the future.

Australia's biggest recession since the '30s is forcing agencies to be far more accountable in the management of accounts. Advertising agency Magnum Opus' CEO John



KEVIN BURGEMEESTRE

Skinner, former head of direct marketing company Wunderman Worldwide, claims that *too much* time is spent on worrying about the future and not enough on doing the job in the present.

Yet companies like Ford advocate the knowledge of new technology whole heartedly. Indeed the head of Ford's Australian marketing, Bruce McDonald, believes it is the role of the agency: "I think the agency has a responsibility to be on the leading edge of understanding or be exposed to new techniques as such and therefore has a requirement to feed that back to their respective clients. So I think the agencies are

very much expected by their clients to be in touch with what's happening broadly, both locally and internationally."

Keeping up with the technology and trying to combat the cynicism and creative inertia of advertisers is the task of McCann's McCaughan and John Rossiter, professor of management at the Australian Graduate School of Management (AGSM) at the University of New South Wales, who have established a think-tank to investigate the issues and potential of new media, like the 'infommercial'. "When people want to buy something they will tell their computer TV they want a four-door six cylinder car under \$25,000 – what are the options? And it will present a half hour programme (an infommercial) on the alternatives," says McCaughan.

There will be a proliferation of options available to the consumer. Technology will allow the feasibility of smaller production runs, better service and fulfilment of niche markets. But as the databases grow and consumers remain loyal to particular manufacturers, advertising and direct response will become in-house. The Japanese spirit will become universal. Companies like Toyota will deal with a family for generations. Or for that matter old Holden owners will never die – their offspring will also become part of the Holden community helping to dictate product development via interactive media as to the cars they want to drive in the future.

In a twist on the *7Up* television series, agencies and advertisers will track people throughout their lives and build up profiles of individual family members.

● LOCK UP YOUR DATA

Integrity may solve the issue of privacy. If consumers feel comfortable with relinquishing information to companies and therefore into a database, then interaction and better targeting will occur.

Jo Lynch, author of the 1992 report 'The Evolution of Retail Media', says there is a fine line between what is experienced as intimate and what is considered invasive. "Consumers will not rely on the good taste or good manners of advertisers but will demand legislation guaranteeing the individual's right of privacy. The misuse of information will become the burden of advertisers facing stiff penalties and even loss of licence."

Yet, as a recent Independent Commission Against Corruption (ICAC) investigation into the corrupt acquisition of private documents found, the quest for information is rife. The investigation grew out of mounting public concern over the selling of private government files. Although ICAC's jurisdiction is New South Wales, the involvement of certain Commonwealth organisations presented national implications.

Sources of the information included the Department of Social Security, Telecom (including silent numbers), elec-

tricity, immigration and Australia Post.

"Prominent purchasers of the information," the August 1992 report stated, "included several major banks, finance companies and insurers, whose officers sought and obtained it, in most instances knowing that it had been unlawfully obtained by corrupt payment." While this report focused on the corruption relating to credit recovery it is easy to imagine the practice being far more widespread when money is involved.

The ICAC report found the document trade ran into several hundred thousand dollars. The finance industry in particular embraced the buying of individuals' confidential files, including leading banking institutions like NAB, Westpac and the Advance Bank.

Summing up the issue of integrity the ICAC report also encapsulated a cultural period: "Maximisation of profits in the '80s and minimisation of

losses in the '90s are no doubt worthy goals in purely economic terms. But... business must be conducted with due regard also to the requirements of integrity and responsibility."

ICAC will obviously be another motivation for companies to improve relationships with consumers. Mailing lists may be expensive – but not nearly as devastating as a public relations campaign required to resurrect the reputations of those responsible for illegal data collection.

In the U.S. a company called Equifax Inc. compiled information based on social security numbers for a software named Lotus Marketplace. Lotus offered CDs containing the names, addresses, estimated incomes, consumer preferences and other personal details of 120 million Americans for \$695. But after receiving 30,000 acrimonious enquiries from people alarmed about their privacy and demanding their files be removed, the company withdrew the product. Yet 'smart cards' continue to proliferate from garages to supermarkets; the information can be traced and the databases sold or integrated into other networks.

Gawen Rudder, an account director with Chiat/Day Mojo, whose clients include Telecom, points out that American telecommunications supremo AT&T operates one of the most successful credit card systems in the U.S. He refers to Australia's shadow minister for communications Warwick Smith's recent suggestion that Telecom establish a bank. Significantly he adds that human reliance on telecommunications will become even more habit forming, creating the situation where individuals will have a phone number over their entire lives.

Conspiracy theorists can take heart that not only will we unwittingly fall into a scenario resembling the Australia card, but we will have a cashless society via an EFTPOS system hooked up to our TV sets. Jim McKay of Interactive Marketing, the organisation behind interactive television, says this is already available for about \$450.

Interactive TV will be introduced nationally by 1994 on the Seven Network with 250,000 sets being given away free



An interactive program developed by the SoftAd Group to target 'upscale PC users' with information on new model Ford cars.

to achieve an immediate penetration. The company has an affiliation with the Grundy organisation, thus explaining the game show angle they are pushing so enthusiastically. Interactive TV is backed by Grundy, whose \$140 million dollar turnover is largely generated from game shows. Sport also has a high priority. McKay attests that the amount of people who watch an average of 28 hours of TV per week are particularly interested in games, sport and interactive programming. The IT gurus, he believes, are far from representative of the public, despite their rhetoric.

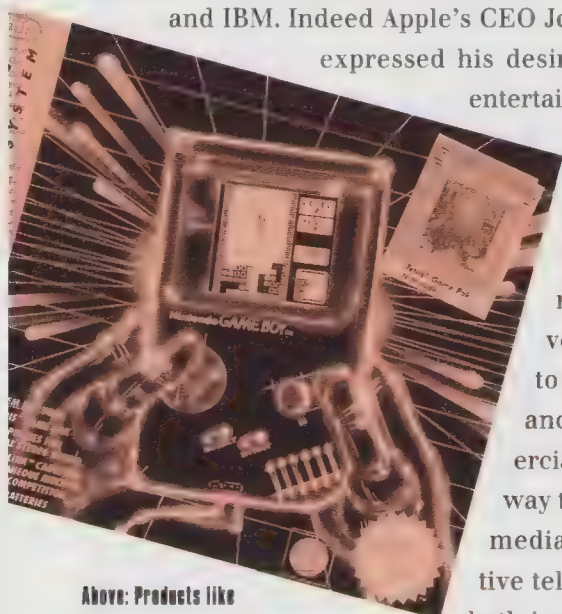
● IT'S ALL A GAME

Similarly the 'Nintendo generation' are ushering in new advertising technology through video entertainment. It is entertainment that is most likely to familiarise the younger generation with technology. Game shows of the '50s made TV a popular technology, as it may do with interactive television. Video rental made VHS the preferred medium over the superior videodisc. Now the latest versions of Nintendo, with interactive capability on TV or multimedia units, will push the new media even further. Indeed, Nintendo has made the likelihood of CD-ROM more tangible.

After taking over Columbia Pictures, Sony has now forged an alliance with video game giant Nintendo (the U.S. video game market alone is currently worth \$6.9 billion), making the likelihood of video games based on CD technology inevitable. The president of Sony electronic publishing, Mr Olaf Olafsson recently stated that: "CD-ROM video games which combine digitised video, CD quality sound, tremendous memory and revolutionary graphics, will drive video and music entertainment to the next level of truly interactive entertainment."

Strong strategic alliances are developing between companies, notably Sony and Nintendo, but also Microsoft, Apple and IBM. Indeed Apple's CEO John Sculley recently expressed his desire to move into the

entertainment industry. The major benefit that interactive television promises is competition with direct marketing. Advertisers will be able to track the performance of any TV commercial in much the same way they could with print media coupons. Interactive television and Pay-TV, both imminent, will act like magazines, providing viewers with a variety of specialist entertainment allowing better advertising targeting. 'Feel good' products, for instance, will associate themselves with feel good movies.



Above: Products like Nintendo 'Game Boy' help usher in new technology by rapidly introducing developments into day-to-day popular awareness.

● THE MOVIE MAKERS

While advertising is a reactive industry – maybe even cannibalistic when it comes to ideas and selling to the consumer – on a marketing level there are more proactive examples. Indeed, the prospect of database exchange pales in comparison to the debate revolving around product placement in cinema which, to media commentators, smacks of subliminal advertising.

Entertainment may be dictating the direction of technology, but advertising is to an extent dictating the entertain-

Lord Leverhulme's remark that he knew half his advertising was being wasted, he just didn't know which half, will clearly be addressed in the future.

ment. The *Atlantic Monthly* recently published an article on the way cinema had become pap – a vehicle for gratuitous product placement. Not only is it obtrusive, it is, to quote *Film Comment* editor Harlan Jacobsen's lament, turning movies into product line business. Story lines are more like ads. "Today Hollywood not only turns good writing into bad movies but also turns good movies into advertising. Movies are becoming a product line business, like Detroit or the cereal business."

Conversely, as director Ridley Scott promised his crew working on a Pepsi ad, "this is just like doing a small feature".

● HI-TECH VS HIGH-TOUCH

Print media is also utilising new technology to personalise advertising. "In the future our magazines will address *you* personally in the advertisement," says George Beaton, quoting Time/Warner's experiments with magazines. "Clearly it is expensive, but in the premium end of the market it is imperative to be able to communicate."

Lord Leverhulme's remark that he knew half his advertising was being wasted, he just didn't know which half, will clearly be addressed in the future. Integration of direct marketing with public relations and brand placement advertising – making two plus two equal 22 – is a trend that will be better serviced with technology.

But, as Rudder notes, for all these brave new world scenarios and no matter how seduced we are by the relationship with advertisers and technology, for every step forward there will be a step back.

"There will always be a mix of hi-tech with hi-touch. There'll always be a balance, otherwise we'll tip ourselves over the edge... Well I hope I'm right." ●



DEMAIN SE DECIDE AUJOURD'HUI

The future is
Determined Today
(L'Institut d'Art Visuel,
Orléans, France 1981.)

Self-promotion
poster for a recent
Grapus retrospec-
tive that took the
environment as its
theme. For Grapus,
the Mona Lisa has
become a symbol
of 'Mother Earth',
representing a
balance between the
needs of the human
population and those
of other species.

PUTTING ETHICS INTO ADVERTISING

Increased awareness of ethical and moral issues is one of the fundamental challenges which marketing of the future will have to accommodate. That's not the opinion of *Choice* magazine or the environmental lobby, but of marketing doyen, Frederick E. Webster Jnr, the professor of marketing at Dartmouth College in Cambridge, Massachussets in the United States.

"Our traditional models of consumer choice behaviour are built around a single model," he wrote recently. "That the consumer will do those things which offer the most pleasure or personal gain per unit of expenditure. But consumers are also members of communities, groups, families, cultures and sub-cultures. They are social beings. Not all behaviour can be understood or explained by reference to the pleasure motive.

"Marketing as a practice and a field of study needs to come back to a central concern for the social, political, ecological and moral motivation of consumers, and of business buyers as well, that it flirted with too briefly in the mid-1970s. These may be some of the most important issues forced on marketers in the 1990s. At their core is a recognition that most of our actions as buyers and sellers have public and moral consequences that go well beyond the simple private pleasure that we derive from a market-based transaction."

THE GROWTH OF ETHICAL ADVERTISING

The turning-point in the development of a socially-responsible graphic arts culture was the establishment of the Atelier Populaire poster movement in May 1968, at the time of the Paris riots. In one month - collaborating with workers, trade unions and socio-cultural groups - they designed, printed and distributed hundreds of crude, irreverent posters, printed on recyclable materials or stencilled directly on walls.

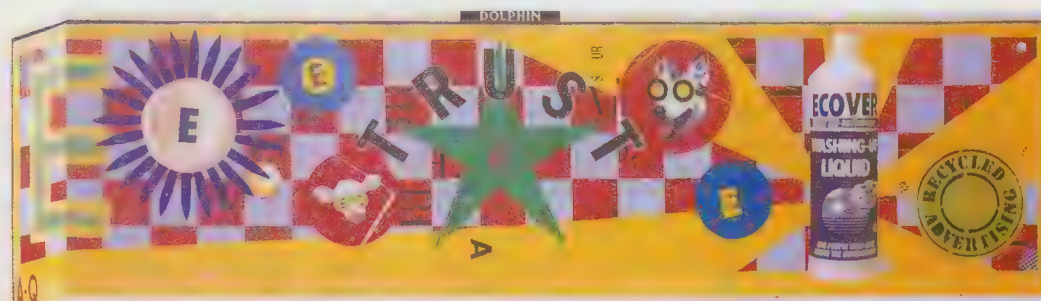
When the police stormed the Atelier barricades and raised their guns to shoot the radical designers, they were confronted with a wall of modern masters. The Art School's valuable painting collection had been taken from the walls and used as a shield! After all, what self-respecting French gendarme would mow down a 'Monet'?

Environmental advertising came of age in August 1991, when 51 unique billboard posters appeared on the streets of London and Brighton. The billboards were commissioned by Ecover, a company which had avoided advertising - a position they were forced to reconsider in the face of mass marketing of new, 'green' products.

Using sheets of unused printed billboard posters and found objects, artists created one-off, 10 x 40 foot collages. Each billboard was to carry an Ecover product shot and a stencilled impression of the 4 foot diameter 'Recycled Advertising' stamp.

"London has turned into a huge art gallery," exclaimed the British press, describing the billboard campaign as, "one of the foremost art exhibitions of the 20th century". Indeed, the billboards featured at the Victoria and Albert Museum after the campaign ended. For the advertising team Chiat/Day and the artists involved,

the success of the campaign represented more than an economic triumph: they created art for the street, challenged a set of dominant marketing values, and got the recycling issue out onto the streets and onto the agenda. ● JULIA CHURCH



This poster from the Ecover recycled advertising project in London was designed by Archer/Quinnell. Each artist or group was given four days and some warehouse space in which to assemble their scavenged items into this unique form of street art.

The Shop of the New

Right: Cardboard filing system by Ism Objects, made entirely from recycled material. The files themselves are constructed by folding rather than by using glues or staples and is itself recyclable.

Far right: Solartek Solabeam torch. A totally self-contained rechargeable torch with solar cells which provide all the necessary power to recharge the batteries up to 1000 times.



Hi-tech and eco design will eventually dominate all our lives. Ian Miles reports the shape of things to consume.

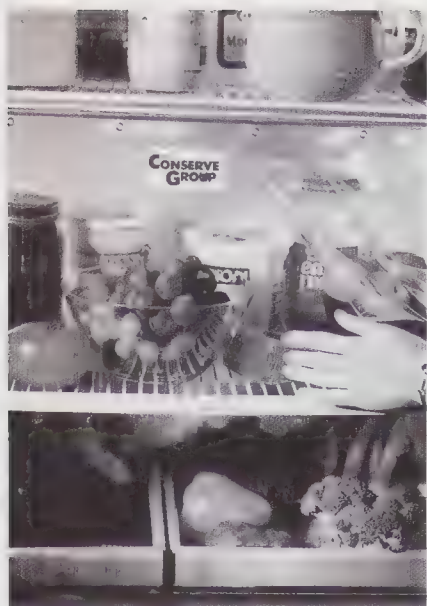


all these new products come from? There is an enormous range of new consumer products based on Information Technology (IT). Microelectronics are already used widely in the home – in the controls of microwaves and many other products, in the processing of digital audio in CD players and of graphic images in video games consoles, and in practically all consumer electronic products. Manufacturers have been trying to find the ‘next thing’ – the next mass market product, following on previous successes such as colour TVs, video recorders, CD players, and camcorders. They look to it to provide the heart of the substantial new successes.

In less than a generation we have become accustomed to gadgets that have come to dominate our lives. Our children will be *au fait* with personal computers and CDs, not to mention the likelihood of nanotechnology running the washing machine.

Numerous new consumer goods and services are in the shops, and others are just beginning to emerge from the research laboratories. Consumer products have played important roles in the massive transformations that have taken place in our ways of life. But where do

One of the big problems that manufacturers face is defining exactly what new products are for. In the past this has led to some major failures. Phillips launched videodisc systems alongside videocassette recorders, under the impression that people would use discs to watch high-quality films and recorders to “time-shift” TV programmes. The failure of the videodisc market to take off, and the growth of video rental stores, look predictable in retro-



The Conserve Group's CHILLshield. Using two layers of overlapping clear vinyl, a principle employed in industry for years, this system prevents excessive cold air leaving the fridge when opened and cuts annual electricity bills significantly.

spect. But at the time, there was considerable uncertainty about just how new products would be used.

This is even more obvious in the case of the home computer. Manufacturers tried to sell it as something you would buy to educate yourself

about it. And certainly many parents bought home computers to encourage their children to learn about it. But as we all know, the dominant use of home computers has been for playing games. Parents have come to accept computer games as an inevitable fact in their homelife, having been cajoled into this by the educational claims which manufacturers continued to foster, and which their children deployed tactically.

Perhaps the most interesting mismatch has been the case of videotex, which was initially seen as a way of giving the general public online access to databases and other information services. Tied to this notion, and a series of unfortunate design choices that followed from it, Britain's Prestel was the first in a series of expensive failures to create a mass market for such services. In contrast, France's Teletel system is a conspicuous success, at least in attracting considerable public use. (Whether it has recouped the huge investment it required, including the costs of the free distribution of Minitel terminals, is another matter.) But what turns people on in the French system is not access to databases, but the opportunity to engage in 'messaging'. This involves not only conventional electronic mail, but also various types of on-line interpersonal interactions, some of it of a decidedly seamy nature. (As in the case of videotapes, new markets have been tapped, allowing people access to types of information and communication which were effectively suppressed in traditional media. The ensuing moral panics may be encountered with future innovations, too.)

The suppliers of newly emerging consumer products face considerable uncertainty about how they are likely to be used and how they can be sold to us. This is strikingly apparent in

One of the big problems that manufacturers face is defining exactly what new products are for. In the past this has led to some major failures.

the case of two important innovative products, where there is even more uncertainty about what they should be called.

The first is consumer *multimedia*. The last year has seen the general release of a number of products which use compact disc as a medium for carrying, alongside hi-fi sound, textual information, pictures, animations and even full-motion video images. Several competing systems, using different technical standards, are currently on offer, such as Commodore's CDTV and Phillips CD-I. These new media occupy an ill-defined middle ground between home computers (they are interactive, you can play games on them) and audio visual equipment (they can be operated by remote controls, you can watch, or listen to a 'program').

So far the manufacturers have done a poor job of impressing the public of what these products are and why people should want to use them. This reflects their own uncertainties – in the laboratories these looked like tremendous devices, and it must be said that some of the software is very impressive. But what are people meant to do with interactive access to this variety (and vast quantity) of information? Is multimedia an adjunct to the home computer (as Commodore now seem to think), or to the TV and stereo (as Phillips has sought to stress, down to the "look and feel" of the CD-I player and its remote control)? Is it an educational tool (encyclopaedia, language tutor, home study centre), a natural progression in entertainment (karaoke, pop videos, serious music with background documentations, etc.), a souped-up games machine, or a combination of all of these? How can interactive use be combined with family entertainment? And so on.

Even more problems are associated with *home automation*, our second example. Various ungainly terms for this field have been floating around for several years now – smart houses, interactive home systems and many more. The common aim is to network services within the home, allowing information to be exchanged between them. But the manufacturers of different services, and other interested parties (like electricity and telephone companies), have different ideas of

Products whose designs address environmental concerns are being compiled by the Centre for Design at RMIT into a database called 'PROBE'. The database will include computerised information linked to a collection of high quality visual images of Australian and international products. 'PROBE' encourages designers to think creatively, seeing environmental concerns as a challenge to their ingenuity rather than a constraint. The Centre for Design is also developing a program to assist companies to develop internationally competitive products with a reduced environmental impact – giving manufacturing companies, with a commitment to produce and market such products, improved research and development capabilities. These pages feature items from the 'PROBE' database.

The examples of failed innovation, and the problems in determining the nature and uses of new products, indicate strongly that firms do need to take consumers much more fully into account.

what forms this interaction may take. Already such conflicts have lead to an American programme of developing and introducing "smart houses" to run into serious trouble, and in other countries it is now recognised that the emergence of home automation will be a much slower process than expected.

On the face of it, such systems offer considerable possibilities. Energy use can be optimised, both to save costs and conserve power, by switching devices on and off at more appropriate times – for example, meters could signal washing machines to turn on only when electricity tariff levels are low, or the lights in a room could turn off if it has remained unoccupied for long periods. Alarms of various types could tell occupants, or telephone appropriate authorities, if there are intruders, fires, or other emergencies. Phone conversations and video recordings could be piped from room to room. These and many more facilities are being explored by a large number of firms looking for new consumer markets – and related innovations are being pursued by people eager to help disabled people overcome some of the obstacles they face in their home life.

The problem is that there are too many problems. A multiplicity of different objectives are being addressed by some automation, and companies are often finding it difficult to co-operate in realising them. Is the focal point of home automation – or the trigger for consumer markets – to be security, energy management, entertainment, or what? How are the controls to be designed? What are the respective roles of the telephone, TV, home, computer and electricity meter (all have been promoted as candidates for the role of centrepiece in home automation systems)? Or should we dispense with the notion of a central controller altogether; and distribute 'intelligence' around a large number of interacting services? What should the communications media within the home be – cables, radio, infra-red? Are we talking about installing whole new systems, even building new homes, or about a much more incremental process? And so on.

The KYOCERA Ecosys a-Si printer with its refillable amorphous silicon print drum that dispenses with the usual toner cartridge.



ECGD Design's SolarBlind functions as a normal blind while absorbing electricity during the day, to be released as light at night time.



Consumer multimedia and, in the longer term, home automation, are likely to be the important innovations with which we will all become familiar. But the path will not be a smooth one, as the troubles being faced by their producers already demonstrate. And these troubles tell us something about the origin of the new products.


They have not emerged in response to consumer demand, as expressed by, for example, letters of complaint or answers to market surveys. Rather, most new consumer IT products have been generated by researchers (and in some cases visionary entrepreneurs, such as Sony's Akio Morita) who are enthused by technological possibilities. They look at the potentials offered by more powerful, even smaller, and increasingly powerful microelectronics, and ask what problems it can be applied to. Information-processing solutions thus hunt for problems to solve.

In this process, it is usually very late in the day that consumers are involved. The greater bulk of the effort in designing how it is configured and what functionality to give it, and even in trying out its final packaging and presentation, is carried out within or between companies. Forecasts of future markets, images of future consumption practices, are designed to convince necessary collaborators and sources of finance of the potential of the innovation to be a mass market success.

Of course, it is not an easy matter to involve the general public in specifying what innovations we would like to see, or even in reacting to the bright ideas of laboratory researchers. But the examples of failed innovation, and the problems in determining the nature and uses of new products, indicate strongly that firms do need to take consumers much more fully into account. We need new technology to improve our ways of life – not to have our lives fit uncomfortably into products made by engineers, engineers (even if these are software engineers!). New IT is a supremely malleable technology, and there is no reason for new consumer products not to be life-enhancing – except for the lack of input from the end-users into the design process. ●

VIETNAM

telecommunications Now

After years of being on the international black-list Vietnam's economic and telecommunications systems are being reshaped with the help of Australian business  Jo Painter reports.



HO CHI MINH CITY BY NIGHT

HEAT, DUST AND THE SHRILL WHINE OF MOTORBIKES are no deterrent to a small crowd of people waiting patiently to use a newly installed public phone. A dozen eyes scrutinise the telephone's sleek plastic casing while as many ears listen eagerly to the one-sided conversation. With the slip of a card, the phone can connect a caller with anywhere in the world, access electronic mail, check out the latest stock prices or compare currency rates. The minutes pass, another call ends, and the line shuffles slowly forward.

The scene could be anywhere: Sydney, Tokyo, New York, Berlin. But this is Vietnam, and the technology which makes the calls possible is Australian.

When Vietnam's Directorate-General of Posts and Telecommunications (DGPT) installed the card operated, public phones in downtown Ho Chi Minh City (formerly Saigon) earlier this year, the residents were understandably impressed. In a country where electricity is sporadic and where refrigeration comes on the back of an ice cart, the appearance of the public telephones was a tangible sign of Vietnam's pending modernity.

After decades as an international pariah, Vietnam has come in from the cold. Economic reforms dating back to the 1986 policy of *Doi Moi* (the Vietnamese equivalent of *perestroika*), are slowly reshaping this war-torn country. Parallel diplomatic and political developments have seen Vietnam again enter the family of Asian nations, albeit it as a poor cousin.

While Vietnam grapples with the social and political effects of rapid reform, long-term trade partners like Australia must also adapt to the changing status quo. At stake is a huge and potentially profitable market and the chance to secure a market niche before the U.S. lifts its trade embargo (a decision on which is expected in early 1993).

While Australia has been prominent in Vietnam's development, competition from other Asian nations has become intense. Is Australia equal to the challenge, or is it squandering its opportunities? Vietnam has attracted more than US\$3 billion in direct foreign investment since 1987, much of this from Asian neighbours such as Taiwan, Korea, Singapore and Japan. Australia, Vietnam's fourth largest trading partner, has also played an important role in Vietnam's economic revival.

Telecommunications giant Overseas Telecommunications Corp International (OTCI) is a key player in the process of rebuilding Vietnam's battered infrastructure and reconnecting it to the rest of the world. Along with many other Australian companies (200 at last count), OTCI is helping usher Vietnam into the 21st century.

Soon after *Doi Moi* was announced, OTCI presented the Vietnamese government with a model for Vietnam's commu-

nications revolution. Based on the principle of self financing and incremental development, OTCI's model laid the foundations for Vietnam's domestic and international communications infrastructure.

The first earth station, installed in Ho Chi Minh City in 1987, was a small affair, providing circuits for five telephone, one telegram and eight telex lines to OTCI's Sydney headquarters and then to the rest of the world. A second earth station followed in 1989 and in 1990, OTCI signed a 10 year business contract agreement with the DGPT to spend US\$66 million developing Vietnam's telecommunications infrastructure.

The four earth stations, including the recently completed AXE-103 gateway exchange in Ho Chi Minh City, have helped boost international transmissions from 800,000 minutes in 1987 to 14 million in 1991. Future plans include the

Telecommunications development in Vietnam is mirrored by business development.

A new Satellite dish, and a modern building nearing completion in Ho Chi Minh City.



introduction of a cellular mobile telephone system, packet switched data and credit card telephone facilities.

To help secure Vietnam's place as a potential communications hub of Asia next century, OTCI recently signed an agreement to lay a submarine fibre-optics cable linking Vietnam to Hong Kong, Japan and Thailand. Once completed, the cable will integrate Vietnam into a global fibre-optic network and provide the capacity for large volume inbound and outbound information flows needed by the multinational investors.

OTCI's Indochina manager David Wicks is proud of the company's achievements in Vietnam. "I think most of the business that is in Vietnam and most of the trade wouldn't be

investment in Vietnam – that has been acknowledged by quite a few people in Vietnam. If you look at telecommunications development in Vietnam, it is mirrored by business development.

“In another two to three years, Vietnam will have an extremely robust system that will make it an attractive place to set up offices. Telecommunications really lead other important areas of infrastructure – the things that limit Vietnam now are the availability of reliable power, finance and transport.”

Yet Vietnam's transition towards a modern, industrial state is not without its contradictions. OTCI's earth station in suburban Ho Chi Minh City is a visible symbol of the uneasy mix of expensive high technology and traditional culture in Vietnam today. The earth station is surrounded by a high, chain link fence and guarded day and night by vigilant secret police. Inside, three concave satellite dishes peer into space, their precisely engineered surfaces linking Vietnam with Asia, Australia and the rest of the world.

Across the road from the station, unemployed Vietnamese sip coffee in darkened cafes. The coffee is brewed over a wood fired oven; the cafe badly lit because of a power shortage. A few blocks away, ramshackle huts clamber for space by a murky river. Legless beggars, veterans of America's war with Vietnam, compete with homeless women for charity.

While Australia has been prominent in Vietnam's development, competition from other Asian nations has become intense.

Closer to the city centre, where rich Westerners enjoy the comforts of air conditioned hotels and colonial style terrace restaurants, the beggars decorate their wounds and accentuate their deformities to attract more sympathy. Like the cyclo drivers, they have paid the secret police for the right to 'work' the lucrative tourist area – their existence is less precarious but no more comfortable than their suburban colleagues.

With an average annual wage of around US\$200, Vietnam is one of the poorest countries in the world. The sudden influx of money and the emergence of an entrepreneurial class in this bastion of Asian communism, has exacerbated social tensions and poses a difficult dilemma for the authorities.

Associate Professor Stephanie Fahey, Director of the Victoria University's Centre for Asian Pacific Studies explains: “They have thrown out economic Marxism but what concerns me is that they have thrown everything out, particularly in the south. I don't think they are terribly concerned now about inequality, and they are starting to believe in the old trickle down approach that you encourage some businesses – the belief there will be spinoffs for other people and that it is all right for an elite to develop in key business sectors.

“There is no doubt there is potential for even greater inequality – I am just not sure how long it is going to take to emerge and for the tensions to become critical.”

While she does not foresee an unravelling of communism such as in Eastern Europe and the former Soviet Union, change is inevitable. “I can't see that happening in Vietnam, you don't get the sense that it is going to unravel. There isn't a groundswell of opposition. There is certainly economic development, but the way it is developing is more in terms of what one would see as a conflict of interest. There is a very close [familial] link between government officials and business... and businesses are becoming horizontally integrated with the state,” Dr Fahey said.

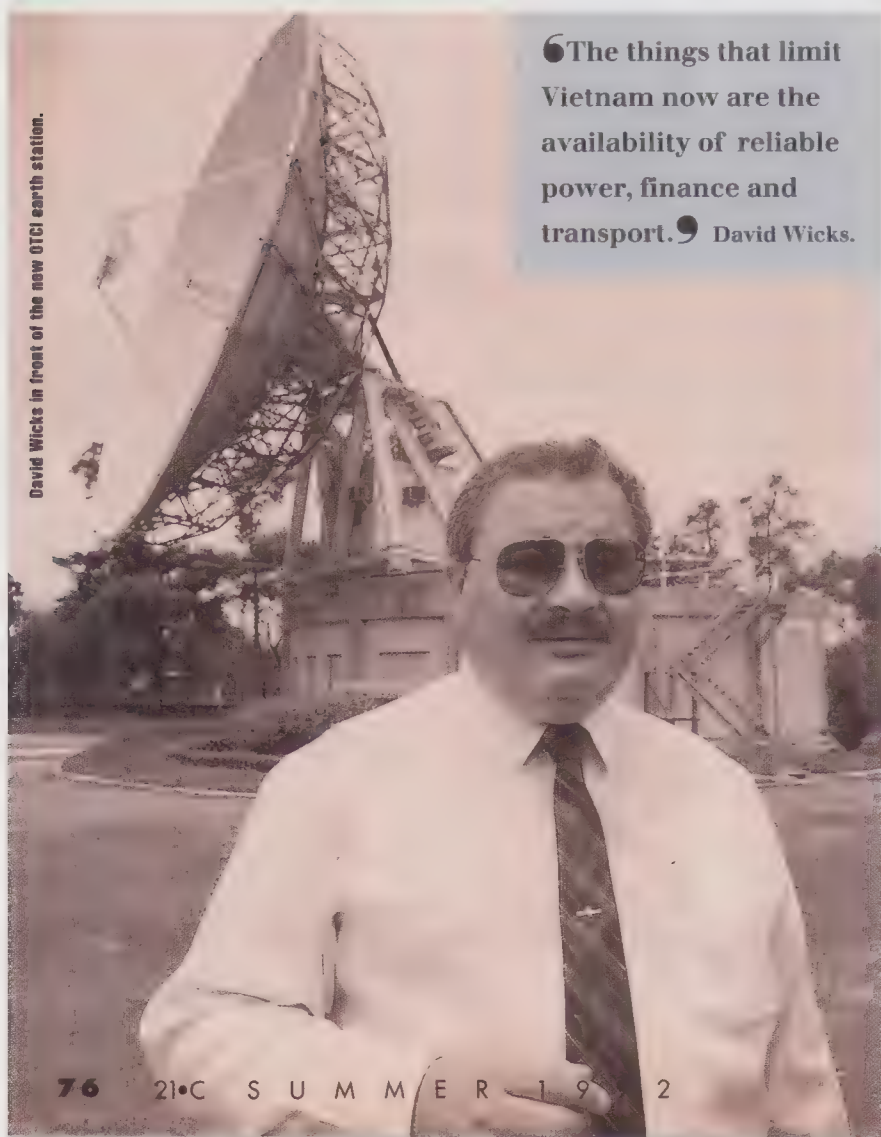
Political change, while far less radical than the economic reforms, is taking place. The July national elections saw a dramatic shake-up in Ho Chi Minh City's administration, with many of the old guard voted out and younger, more reformist communists elected in their place.

“I do think Australia is squandering its opportunities here,” says former Sydney property developer Gary Dilworth, who has just signed a joint venture agreement with the Ho Chi Minh People's Committee to develop a 50 room hotel in Ho Chi Minh City. “At the moment we may be technically the fourth biggest trading partner but when you look at Taiwan

In another two or three years, Vietnam will have an extremely robust system that will make it an attractive place to set up offices.

“The things that limit Vietnam now are the availability of reliable power, finance and transport.” David Wicks.

David Wicks in front of the new OTCI earth station.



and Singapore's investment, Australia just doesn't figure. Australia must look outward, past its own borders. It must invest in Asia. There is marvellous potential here but you must look to the long-term."

Among the difficulties Mr Dilworth encountered in his early business dealings was official distrust of Westerners. "Two years ago it was 'spook' territory – you would have people follow you everywhere. Now things have relaxed, although there are still problems doing business here."

Other Australian business people, and particularly those working in exploration and mining, report similar experiences. Doing business in Vietnam, reports one Australian now living in Hanoi, means doing business with the secret police. "When I arrived I went to the ministry and 'invited' one of their staff to join me and ensure 'I didn't make any mistakes'. They are quite open about it. I have someone

watching me all the time – they go through my files, read my mail and find out where I go at night. But you get used to it and as long as you are straight with them, there are no problems."

Even tourists report regular run-ins with the 'spooks'. Men with long

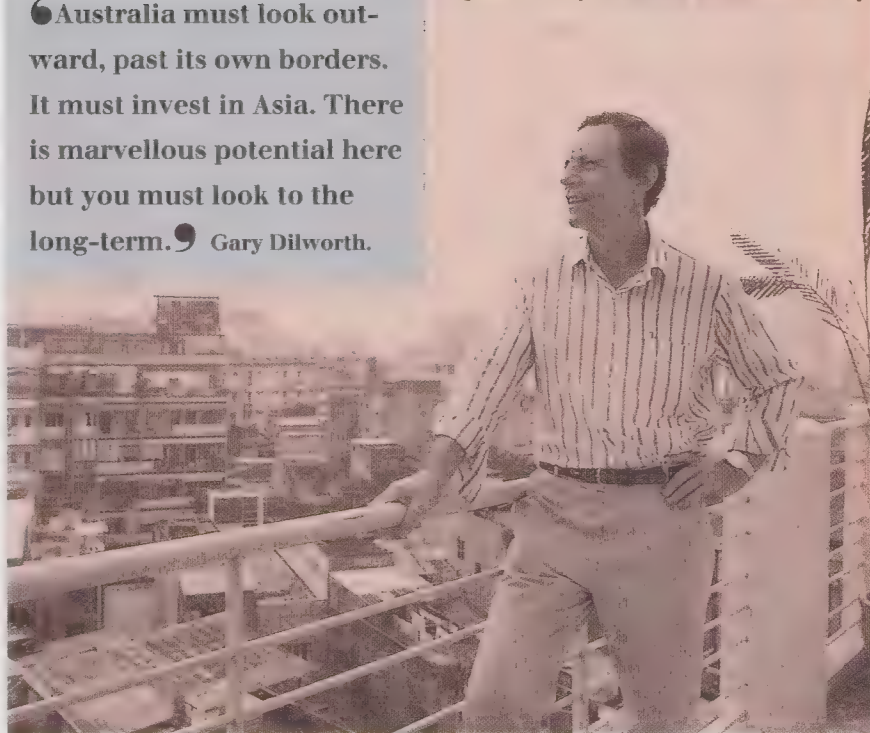
lens cameras and inquisitive natures photograph tourists around the Prince Hotel, a favourite backpacker haunt in Ho Chi Minh City. Western tourists and business people are regularly followed and a small army of informers ensures the secret police are always kept fully informed.

The overt presence of secret police is a daily reminder that while Vietnam is towing the capitalist economic line, ideologically it remains a one party communist state. However despite the police scrutiny and bureaucratic red tape, investment in Vietnam is booming. In July, 17 foreign investment licences worth US\$86 million were granted by the State Committee for Co-operation and Investment. The same month, former Australian Prime Minister Bob Hawke visited Vietnam for a four day 'power talk' with government officials, the latest in a series of high level contacts between the two countries.

A further sign of growing trade relations was the recent opening of an Austrade office in Hanoi. According to Austrade commissioner Mr Denis Wholley, Vietnam represents a window of opportunity for Australia, particularly in light of the U.S. trade embargo. "The embargo gives Australia a competitive edge – as Vietnam's economy improves, companies [that] have been here and established a base will have a tremendous edge."

Australia must look outward, past its own borders. It must invest in Asia. There is marvellous potential here but you must look to the long-term. Gary Dilworth.

Gary Dilworth on top of the Norfolk Hotel in Ho Chi Minh City.



Unlike other Australians in Vietnam, Mr Wholley is optimistic about Australia's continuing role as a major player in Vietnam's economic development. "I think it is very encouraging. The shifting emphasis on Austrade's activities reflects the importance Australia places on the Asian market, and on Vietnam," Mr Wholley said.

Vietnam's enthusiasm for capitalism is tempered by the constraints of war damage, appalling infrastructure and past economic instability. In 1989 the Government embarked on a campaign to rein in rampant inflation, running at 300 per cent in 1988. This forced many new small businesses into bankruptcy and sent shock waves through Western investment circles.

Inflation was reduced to 68 per cent last year, but other economic and social problems remain. These include the limits imposed by infrastructure, some of which is centuries old. The national highway linking Hanoi and Ho Chi Minh City is in places little more than a dirt track and the train line is little better.

In the words of one Australian diplomat, "Vietnam is like nowhere else in the world". With its grand scenery, gaunt moonscapes and rich paddy fields, it is a country of contrasts. There is a certain mercurial quality about the people, from the brash invasiveness of the secret police to the spontaneous generosity of complete strangers and the shy beauty of the children.

Like the mouldering grandeur of Hanoi's colonial villas, Vietnam is a country of immense potential waiting for renovation. Australia has played an important role in securing the foundations – only time will tell if we will be there for the house warming. ●



Secret police photographer in operation on the streets of Ho Chi Minh City.

.....

The overt presence of the secret police is a daily reminder that... ideologically Vietnam remains a one party communist state.

War of the Words

Education is a key agent of social continuity. Yet education, and the society it serves, are being undermined by some serious, unanswered questions about underlying cultural assumptions, present trends and future directions. The subject has been aired by politicians and academics alike, and wide-ranging reforms are undertaken every few years. The field is faced with a vast array of structural changes, growing unemployment and the decline of traditional blue collar jobs in the face of new technologies and labour market restructuring. Such issues cast a long shadow over traditional means of teaching and learning. It also gives credence to the study of 'futures' in schooling which potentially places the tools of self-mastery and responsible citizenship into the hands of young people and shows them how to be involved in creating their own future.



In this edition, Sonia Harford explores the issues of technology, education and 'globalism' and the effects of each of these areas on the process we know as 'education'. Harford also profiles Brian Start whose work with children of higher intellectual capabilities may have broader implications for teaching in general. Ashley Crawford profiles the co-author of *Education for the 21st Century*, Professor Hedley Beare, while Rick Slaughter considers the increasing role of futures in education.

{ EDUCATION FUTURES }

Painting a New Picture

Hedley Beare is breaking apart the framework of educational structures, and the picture within.

◆ ASHLEY CRAWFORD REPORTS

THE PUBLICATION IN DECEMBER OF *EDUCATION FOR the 21st Century* by Professor Hedley Beare and Dr Richard Slaughter may establish some fresh ways of looking at the problem of how education can respond to the emerging world picture. The book may also cause as much controversy as it does guidance with its suggestion that before effective reforms can be implemented, the entire existing structure of educational institutions and philosophies must be profoundly questioned.

Beare, a gentle, thoughtful man, in some ways fits the traditional image of an educator. Quietly spoken, lightly built, with an avuncular manner and a ready smile, he looks much like university professors the world over. However in terms of attitude and viewpoint, Hedley Beare is anything but conventional.

The subject of educational reform brings a light to Beare's eye and one is left with a distinct sense of passion about his mission. "Throughout the 1980s there was a spate of activity to try to reform schools around the world," says Beare, "but it was particularly severe here in Australia. Every state and territory restructured its administration and there was an attempt to consider what the curriculum was and to push for a national curriculum."

The interesting thing, says Beare, is that this has been paralleled in both the U.S. and U.K. "So obviously something was worrying people about schools. Clearly politicians and those who are managing education policy knew there was something wrong. However, this reform is neo-conservative, he says, "It's tending to say let's build on what we've got and make it better." It is this approach that Beare so strongly resists.

Beare and Slaughter, both based at the Institute of Education at the University of Melbourne, found they had been writing, researching and speaking along similar lines: both felt that reforming the current system was not really the point - that what is wrong is the very framework that system is based upon. "Many of the assumptions are wrong," says Beare bluntly. "We need a different framework to guide theory and practice. We were coming at it from different angles. I was coming at it from the macro-

reform

CRITICIZE

education system

reconstruct / evaluate

ILLUSTRATION PIERS BUXTON

level, looking at systems and people in stress. Rick was saying, "why is it that the future looks so challenging, but educators are not routinely addressing it? What are all the so-called 'futuristic' images in kids media actually saying? And why are so many depressed about the future? We said, if we're designing education for the 21st century we need to start now – partly because the kids in schools will be just out of school by the turn of the century, and partly because it's quite obvious that there are major issues to be dealt with by society before they become full-blown crises.

"Our first three chapters deal with the nature of the paradigm shift which is now underway – we are not only changing the picture – we're taking the picture frame apart. It's a bigger frame which reflects that people across a number of disciplines are asking very similar questions. Across a range of fields, from medi-

"If you regard global awareness as important, then it leads on to a view in which kids have to learn through education how to join in the global community, to learn how our lives are interlinked with a lot of other lives."

cine, physics, politics, economics, education, social sciences, people are looking for a broader, more viable view. So we've tried to outline some aspects of this bigger picture because this is the frame, or world-view, that surrounds education and powerfully affects the ways we think and function in this context.

"For one thing the economic determinism and unbridled economic development which has been rampant for at least this decade in part emerges from a certain approach to scientific enquiry that has marginalised other forms of knowledge and secularised nature. Economic determinism arises from that context. Yet both give a false view of the world, not to say ideas of progress and social development. For example, it's one thing to say a country is industrialised – and therefore earning wealth. But we haven't asked about what happens when the second wave of industrialisation comes along and then the third and then the post-industrial phase.

"What does that do to a society? The question surfaced at a recent job summit. The unskilled jobs which kids had 10 years ago no longer exist and may never do so again. There's no point in talking about re-creating those kinds of jobs – this type of society simply won't support them! Solutions don't lie in incremental change, so much as in seeing the world differently, seeing differ-

ent options. And that requires a different, deeper, approach.

"Even within the economic paradigm as it is, people are beginning to question the nature of industrialisation and what stems from it. By pursuing that limited view of reality, we've created a lot of damage on the planet: ungovernable and impersonal megacities, a de-stabilised atmosphere, ravaged landscapes and the extinction of many wild species. If every country were to blindly follow that route, the future for humankind would be very bleak indeed.

"The second facet we deal with is 'globalism', that is, thinking of ourselves as part of a once neatly balanced set of ecological forces, and viewing the whole globe as a living system. When we realise that human beings aren't just sitting on an inert rock, when we see ourselves as part of that balance and understand that we affect not only other people but the broader environment, that's a very different proposition. It's more like the Eastern view where you see yourself, human activity in general, in a balance of forces. The Yin/Yang view is much more compatible with a living world than the materialism which stems from reductionist science."

However, most Eastern countries have taken the Westernised path of industrialisation. Beare cites Manila as a particularly distressing example of urban sprawl, poverty and out-of-control industrialisation, alongside such disasters like Chernobyl, Bhopal and acid leaks into the Rhine which, he says, "prove that national borders don't exist any more when it comes to these issues".

"If you regard global awareness as important, then it leads on to a view in which kids have to learn through education how to join in the global community, to learn how our lives are interlinked with a lot of other lives."

Education for the 21st Century came close to being called *Ways of Knowing* because, says Beare, it also considers the ways in which particular types of knowledge were developed over the last three centuries and how this process has powerfully shaped "which things we take as legitimate data and which not".

"The scientific movement over the last 300 years has taken only observable, quantifiable data as the evidence used to build up knowledge. But we know very well that that science is based on measurement and reason. It actively excludes religion, myth and contemplative forms of knowledge. Yet these 'ways of knowing' have been important since the beginning of the human race, and they remain important. They emerge, for example, in the perception of awe and beauty as well as in human relationships. They help to protect the environment, other species and other people from over-exploitation.

"Many have shown that contemplative knowledge actually belongs at the peak of human experience. But, since science works in a different mode, this kind of knowledge has been ridiculed and largely set aside. This loss helps to explain the great spiritual vacuum in modern societies – a vacuum which people unsuccessfully try to fill with sport, drugs, television – you name it! What we are saying is that we should expand the way in which we develop knowledge by recognising other levels and modes which emerge from the great stream of human history."

Beare cites such sources as Joseph Campbell whose explorations of mythology over various cultures throughout history reveal surprising consistencies of belief systems and rituals; "whichever tradition you come from the same sort of images start to emerge" from Celtic mythology through to Shamanism, he

says. "You just can't dismiss that body of evidence. Just because you can't put it on the scales and weigh it doesn't mean it is inadmissible. Maybe the empirical scales are just too limited."

Such a view has enormous implications for the future because a one-sided culture will have a limited view of reality, nature, human nature and therefore tend to be disaster-prone. On the other hand, a recovery of 'ways of knowing' opens up quite new personal and cultural options. So it is a recovery in a deeper sense, coupled with a re-orientation of educationalists' outlooks from past to future, that Beare and Slaughter identify as the two major conceptual shifts which, they believe, could well alter the whole picture.

Several chapters of the book are devoted to exploring what that involves. "We've both been involved in teaching futures and policy-related courses for some years, so we've had many opportunities to see at first hand how teaching explicitly about futures works out in practice.

"It's really a question of familiarity. Once people have had time to look at the futures literature, try out some of the teaching techniques and monitor the responses of students, they become enthusiastic about including a futures dimension in what they already do. So it seems to us that teaching about futures actually expresses a central purpose of education generally, that is, it puts the tools of self-mastery and responsible citizenship into the hands of young people and shows them how to take part in creating their own future.

"If we take the themes I've outlined: rejecting economic rationalism, changing our patterns of thinking about and perceiving the world, developing a global view and shifting from a retrospective to a proactive outlook; and if we then begin to design an education built around such premises, then the outlook for education and society in the 21st century begins to look very different. That's partly why our conclusion is called 'The Promise of the 21st Century', for we believe it is there. But there is a lot of work to do before it becomes available.

"What we take as teaching has been far too cerebral up to now. Yet there are teaching techniques which we could use and which may be very effective, that teachers have not felt able to use." Beare cites meditative techniques, while acknowledging that meditation side by side with traditional mathematics may cause a jolt to the average parent. "Of course that leads to another problem – dividing maths from physics from chemistry is again part of the earlier scientific approach. The irony of this is that some of the breakthroughs in areas like quantum physics have actually helped to explode the old paradigm. Fritjof Capra, Paul Davies and Stephen Hawking are among those who are pushing us back toward metaphysics and theology, by way of physics and mathematics. They are in effect saying that our science has reached the edge of the universe, yet it is still inadequate."

The difficulty with a neo-conservative approach to education, says Beare, is that it pays most attention to what was known in the past, and either ignores the future or naively extrapolates it. None of this makes sense in a dynamically interrelated world. What emerges is a stereotypical curriculum. It is a 'head-based' approach, says Beare, with competencies defined and tested by traditional 'industrial' means. The problem is that in order to define competence it is again scaled down to something which can be easily described and measured. "You'll be reading to

decode a passage of text, you won't be reading to get a warm heart or a transcending insight which are, of course, very hard to assess," he says.

"We're really saying that if you continue to educate within the paradigms currently established, you should not be surprised that the kids come out depressed and disempowered. But if you adopt a strong proactive stance, and a less constricted world-view, then other outcomes are possible. Inspired by a living, 're-enchanted' universe and a broader view of knowledge, I think that the education system, even marginally changed in such ways, will have a fairly powerful impact.

"The 'downside' is that such changes can take a long time to achieve. But, more optimistically, educators are, on the whole, well-equipped to make them happen. Moreover, the message of

"The outlines of a more sustaining, and sustainable world-view are finally emerging. That provides the grounds of hope for many people, not least of whom are the educators who, perhaps uniquely, are charged with the well-being of following generations."

our book is positive: we believe that after 300 years there is not just light at the end of the tunnel but accumulating evidence that the industrial age is nearly over. What will follow is anyone's guess, but we believe that the outlines of a more sustaining, and sustainable world-view are finally emerging. That provides the grounds of hope for many people, not least of whom are the educators who, perhaps uniquely, are charged with the well-being of the following generations."

Hedley Beare's 'mission' is an ambitious one, but it comes down to the issue of conveying a sense of informed hope and personal control over the future to students. If the current systems continue, he says, then future generations may well suffer from a severely constricted view of culture, knowledge and time. Beare and Slaughter are proposing radical change, but change that could affect the view of the future being taught, and thus the future itself. ●

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Graduating to the Year 2000: the Future of Education

❖ SONIA HARFORD REPORTS

THE AUSTRALIAN EDUCATION SYSTEM IS TRAPPED, it seems, in the past in its approach to the principles of learning. In many ways schools resemble factory assembly lines, with hundreds of students dealing with any number of stressed teachers each day. Physical design and the strictures of time-tabling make schools resemble egg crates, a series of compartments to be rapidly filled, according to the authors of a radical study.

A unique two-year project undertaken by Victoria's Methodist Ladies College signals dramatic changes in the way classrooms may be structured in the future. The study examines changing the length of the school day and week, and decreasing "face to face time" between students and teachers, to improve flexibility and efficiency. It highlights the inherent problems in the Australian school system and proposes possible alternatives.

Many students are now proficient with laptop computers, 'owning' their learning, according to school principal David Loader. As a result MLC hopes to change the emphasis from teachers teaching to students learning, to free teachers from many hours of class preparation and marking.

With the advent of technology as both a learning tool and subject matter, teaching methods and curricula will change significantly.

In a recent newspaper article, Macquarie University communications lecturer McKenzie Wark takes a facetious approach to the traditional emphasis on the three Rs, arguing that in a postmodern world the media young people's single biggest influence. "Why schools and universities should persist with such quaint skills is quite beyond me," he says. "Arithmetic is what calculators were meant for. Novels are for people too dumb to understand *Twin Peaks*." His point is that television and video – spurned by the conservative educator – will inevitably enter the classroom in a reputable guise.

At tertiary level, education will soon be brought to our lounge-

rooms by Melbourne's Monash University, winner of the hotly contested \$48 million contract for Australia's revolutionary Open University. From next year instead of attending on-campus lectures, students can tune into this electronic university by turning on the television. The tyranny of distance will disappear as students, linked by a national computer network, use CD-ROM resources and study material on disc in their personal computers. Beginning with courses in business studies, science, computing, health sciences and liberal arts, Open University will significantly expand in the next three years.

In a positive approach to the future, Macquarie University's vice-chancellor, Professor Di Yerbury, sees a role for technology in increasing effectiveness in an education system hindered by dwindling resources. Information technology, the changing nature

of work and the structure of schooling are all radically reshaping the notion of what constitutes a solid education.

Australia's education standards are among the highest of the developed nations, according to a recent OECD report. However the future for a great many Australian school-leavers and graduates, no matter how well they perform academically, is shadowed by an 11 per cent unemployment rate.

Technology will transform education in Australia, offering

remarkable opportunities for the future. But, for many, the call for a "clever country" is an irritating cliché as more and more graduates qualify for what they believe are fewer jobs. Young people and mature age students pursuing career changes are demanding a stronger sense of their future from schools, universities, government and industry.

In planning for the future of education, the discussion hinges on two major issues; the increasing demand for education at all



A group of schoolchildren work with computer graphics at the Technology School of the Future, South Australia.

levels; and the link between training and work as we respond to a technologically advanced society. These issues draw on perhaps the most contentious area of the education debate. Citing Australia's need to remain internationally competitive, some education professionals have proposed training schemes which specifically equip students for jobs – in the interest of the national economy. However, others fear that if learning is too closely tied to vocational requirements, excellence and the importance of a rounded education will be compromised.

Inevitably, the tension between varying educational philosophies is anchored by more practical concerns for the future. Overcrowded lecture theatres in universities raise the need for more resources, whether funded by government, business or undergraduates – and significantly boosted by that lucrative market, the overseas student.

Education in the 80s. More Australians than ever before are staying at school to complete Year 12. Participation up to secondary level rocketed 40 years ago when the school system was expanded to meet a growth in demand. By the late '60s, enrolments in years 11 and 12 began to grow. Government policies during the '80s encouraged many more young people to stay at school, resulting in a much broader population of university undergraduates.

According to Professor Barry McGaw, director of the Australian Council for Educational Research, the retention rate of Year 12 students in 1983 reached 40 per cent. By 1992, this leapt to more than 80 per cent and, he suggests, "we are rapidly approaching universal upper secondary education". This huge increase in participation in senior school education has a number of effects. Competition is tough for school-leavers seeking limited university places. In 1992, nearly one in three eligible applicants to Victorian universities failed to get a place.

But as thousands more do get places, Professor McGaw says the challenge for universities is to provide appropriate curricula for the wide range of people now seeking education – including the 40 per cent of new undergraduates who are mature age students or do not enter higher education directly from Year 12. He also argues that the university sector may now be too big, while the status of further and technical education is declining. Professor McGaw warned "the public perception appears to be that failure to gain admission to higher education is effectively failure in the final years of secondary school". He claims this leads to "the belittling of the TAFE option".

It is generally accepted that low-skill, mass-production jobs are dying out in Australia. The blue collar workers who once held those positions now face a shifting education structure in which a strong technological skills base is seen as our key to remaining internationally competitive.

Has Education Failed? The rapid march of technology in schools and universities, and the implications for vocational training, will influence assessments of the quality of education. University of Melbourne vice-chancellor Professor David Penington claims there is a perception that English-speaking nations – Australia, together with Britain and the U.S. – fail in their education systems to maintain a high level of skills in numeracy and literacy. He says: "there is a need for us to look more closely at the quality of education".

Australia's education system is inclined to be politicised by the policies of governments which run schools and universities. Victoria's VCE (Victorian Certificate of Education) system, for example, has provoked a furore from those for and against its radical reshaping of Years 11 and 12. However, many other interest groups contribute to the debate.

The Business-Higher Education Round Table recently received wide coverage for its claim that the education system had failed to prepare young Australians for the workforce. The report *Educating for Excellence*, called for a thorough review of primary, secondary, post-secondary and postgraduate programmes.

Based on interviews with 28 leading business and education figures, the report is highly critical of students' lack of communication skills. In summary, the report blames "shortfalls in secondary education" for tertiary graduates' lack of oral and written communication skills. It says they "lack the ability to communicate ideas and to discuss and debate issues, lack the ability to relate, communicate and interact with others... lack training in logic, and are deficient in their ability to conceptualise projects from broad goals through to ultimate evaluation".

Where business respondents rank communication skills as

Young people and mature age students pursuing career changes are demanding a stronger sense of their future from schools, universities, government and industry.

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highest priority, university respondents give precedence to "theoretical knowledge in a professional field", ranking communication skills seventh. Significantly business leaders place theoretical knowledge seventh.

Similarly, business leaders rank "capacity for co-operation and teamwork" third, while university respondents place it in eighth position. The prescription from business' point of view seems clear – increase the emphasis on communication skills, and graduates will get a better hearing from prospective employers. But is it really that simple?

RMIT vice-chancellor Professor David Beanland said universities are in fact getting "mixed messages" from business. "At the moment advisory committees are saying students should have more technical skills."

New Ways of Learning. If the relationship between business and education is more complex than the report suggests, the tertiary sector must continue to combine the training imperative of education, with the achievement of knowledge.

To this end Professor Beanland said: "There should be a component of every course devoted to improving the communication skills of students at whatever level they may be – at the moment that's not being done. Academic institutions tend to overemphasise technical skills, and underrate personal qualities. I think

there needs to be a change there. RMIT is doing a lot to improve the English levels of people from non-English speaking backgrounds, and there has been a dramatic improvement in oral communication skills."

RMIT has close links with industry, and a substantial TAFE component, according to Professor Beanland. "In a vocational university there can be good synergy between technical training and higher education. Many degrees have a strong technical base." As technology revolutionises the future of learning, one RMIT department is introducing an "holistic" approach, designed to develop the innovative potential of future graduates. The Enterprise Training programme, to be tackled by electronic and electrical engineering students, rejects "narrow discipline partitioning" in favour of bridging the gap between the academic and practical environments of their work. The \$4 million programme is partly a response to Australia's perceived weakness in developing ideas, and its lacklustre performance in technology industries. Director Ken Jarrott says the programme aims to develop in students initiative, a broad perspective and an "enterprising disposition", in accordance with the principles of Total Quality Management (TQM) adhered to by many businesses.

There should be a component of every course devoted to improving the communication skills of students at whatever level they may be.

With funding from DEET and Telecom, the department will hold an induction programme next year focusing on study methods, and such topics as "self-management", team building and social integration – qualities not always evident in the study of engineering. This holistic approach acknowledges that once students graduate, they should understand business, and take an entrepreneurial approach, to maximise the application of their technical skills in the workforce.

In designing the course, Mr Jarrott says: "We are looking at the whole education process afresh. In the past the process of education has been mastering facts – there are so many facts to learn – and there has been a tendency to lose sight of being innovative. This country has a reputation and self-image of being clever people, but to a degree there is a national inability to translate a good technological base into commercial use on a global scale."

Mr Jarrott says that in the future engineers will be much more than backroom technologists – "they will have to launch new ideas and work co-operatively with other people. They're in the front line of global competition."

Bill Jenkins, the former general manager of RMIT's research and development arm Technisearch develops programmes linking personal and organisational development with education. He draws on a Harvard study which found that 80 per cent of success in work related to attitude, compared with 15 per cent of success due to knowledge and five per cent to environment. "Universities don't place much store on attitude," he said. "Compared with its potential, education today is wanting. Most

graduates who have knowledge can't always apply it. For some people it takes years until they can be used in junior management. Universities could improve by having students more confident in decision-making and problem-solving. There's no reason why these can't be built into a course."

Of the holistic approach, he adds: "Most of our education breaks things down into smaller components. The danger is we become so narrow and specialised, then find it's not like that in the real world. Because knowledge has widened exponentially we can't hope to know everything. We need techniques to use knowledge efficiently."

Business and Education – Future Classmates?

Engineers and other students at RMIT also further their education through the Co-operative Education for Enterprise Development (CEED) programme which fosters joint industry-university projects. Senior students work with companies to enhance their studies. Professor Penington reveals how far universities have come in their relationship with business: "The British education system which ours draws on had a tendency to hold itself aloof from business. There was a tendency to see anything to do with business as dirty or shop-soiled. But universities are involved with preparing people for work. To have education professionals who view entrepreneurial activity as wrong is damaging."

Even at secondary school level, students are learning about the operations of industry through a Victorian company called Know-Biz Business Education. Since 1985, Know-Biz has taken about 100,000 students in years 10 to 12 on tours of workplaces. Seeing manufacturing or service companies at first hand allows students to connect their VCE studies with industry requirements, and get career information.

Executive Director Marcia Magris said that while little was happening eight years ago, there had been a shift in secondary education towards "designing programs with more focus on industry". She believes employment-related study can even begin in primary school.

These comments point towards the growing importance of the 'competencies' debate, initiated during John Dawkins' term as Federal Minister for Employment, Education and Training. This contentious notion began with the 1991 Finn Report, compiled by a committee established to make recommendations on the education of 15 to 19 year olds. The report advocates stronger links between education, training and work, and coins the term 'employment-related competencies' to describe the skills young people need to enter the workforce.

Competencies: Workers of the Future.

The economy of the future needs workers who have broader more transferable skills, are able to adapt to new technologies and can change jobs when needed.

This statement from a Know-Biz article *Workplace Learning – The Focus of the Future?*, sums up the broad vocational approach of competencies, a new factor in the education debate which is welcomed by the union movement, but has its detractors in universities. The Finn Report specified six areas of competency deemed essential for all young people

CONTINUED ON PAGE 84

Chipping Away at the Small Poppy Syndrome.

❖ SONIA HARFORD.

In our national bid to become clever, there is an acute irony in the fact that students considered too bright are often held back. Professor Brian Start, the exuberant president of the CHIP foundation, calls it the small poppy syndrome – the dark side of the tall poppy syndrome – which speaks of jealousy, satisfaction in mediocrity and contempt for excellence.

The Children of Higher Intellectual Potential foundation is a private body established in Victoria in 1987 to offer counselling, teaching and research facilities for parents and children. With no government help, CHIP aims to allow academically talented children to learn at their own rate. But rather than segregating such students from the mainstream, Professor Start believes they represent the high standards to which all children could aspire in an ideal education system.

"Our work for CHIP children has been an ice breaker," he said. "By having a system that looks at allowing these kids to learn at their own rate and level of complexity – which is twice the rate we usually teach them in schools – we will lift the ceiling for all children. That has a tremendous impact on education. Our current method of grouping children belongs to an era of raising floors – as long as everyone could read reasonably, that was considered to be enough. People who tapped the ceiling did so before without real effort, and in many cases despite the system."

Professor Start is passionate about his subject, and believes more than 35,000 children in Victoria alone are not realising their potential, neglected by the education system. "Until recently the high intellectual potential child was excluded from the 'all' in the principle of *all children have the right to full development*. We have to tell teachers that the needs of people in the top 25 per cent are as varied as the needs of the bottom 25 per cent. We've done the bottom – with special education – but we haven't done the top.

"If you only take five per cent of 700,000 kids (in Victoria's school system) that's 35,000 children who could do what only 25 are allowed to do at University or High School (in an accelerated learning program). It may create an administrative problem, but I'm afraid the administration is there for the children, not the other way around."

In responding to the needs of CHIP children, teachers and the

school system are ill-equipped for change, he says. "We need experimentation for the next five or 10 years in all different ways – let's try special schools, let's try dealing with them in the mainstream schools. Let's get rid of the ideology that has actually abused these children in the last 10 years."

Professor Start said both the Labor and Coalition governments have been unsympathetic to CHIP. He particularly dislikes the Victorian government's insistence on using the term 'gifted children' which, he says, implies somebody has been given something for nothing. "It produces envy. It is also non-specific in that it can be applied to music or sport. In Australia if you have high potential in sport you are sought, you are given the best facilities and the best resources. Gifted sports people are the brahmans of the gifted world."

He claims education only discriminates against academically talented people. "If you are gifted in music you are not required to play *Chopsticks* until everyone else can play *Chopsticks*. You can play Chopin or Tchaikovsky – you are encouraged, there are specialist performing arts schools. So the one area that's singled out for child abuse if you like, is the intellectual area." To judge whether a child is particularly bright, he says: "The best definition is of a child who has the capacity or can perform two or more years ahead of his age peers."

In the light of this definition, there must be a fundamental reassessment of the structure of schools to allow children to learn at their own rate, he says. "We group kids by age – why? It is the only time in their life that people are put with others, plus or minus nine months, of their age group and treated as if they were equals. We talk about schools as preparation for life – that's bizarre."

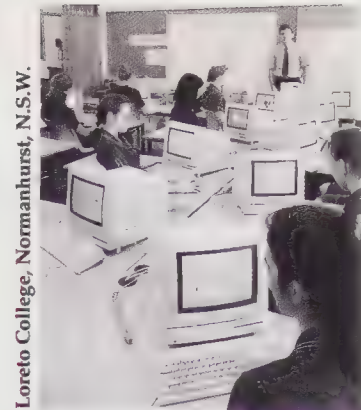
CHIP's own educational programs group students by ability. "So far we've had children who can function at year six level – we don't use age. They've been doing algebra, problem solving and advanced maths going up to age 14. The youngest is 8, the oldest is 12." He is encouraged by the efforts of some teachers and schools who provide vertical learning, allowing children from several grades to study in one class, to jump a grade, or take extension courses. But many of these variations on the standard theme are frowned upon by the current education bureaucracy, he says.

Bright girls suffer in particular, according to Professor Start. "Society has different expectations for girls – lower expectations. The girls pick up the social pressures rather more quickly and subtly than the boys and they start conforming. With high ability girls, high achievement tends to continue after their aspiration drops, so their level of goal drops, and in a couple of years their achievement drops to accommodate their level of goal."

Professor Start puts much of the suspicion towards CHIP down to a jaundiced aspect of the Australian character. "It's often said the underdog is the Australian ideal. If that was as general as it is peddled, why is it we go along to the grand final expecting the best footballers with the best coaches – we don't apply it across. Many visitors label Australia as anti-intellectual. Within education I think the emphasis is on raising floors, not ceilings. That's the problem." ● Sonia Harford is a Melbourne journalist.

"Until recently the high intellectual potential child was excluded from the *all* in the principle of *all children have the right to full development*."

From Fear to Empowerment.



Loreto College, Normanhurst, N.S.W.

We've heard it for years, the future is not just a concept, it's real and it's happening now.

❖ RICK SLAUGHTER REPORTS

What's more it's being taught in our schools.

A ROBOT AT REST. AT FIRST SIGHT NOT MUCH IS happening – no hint of violence or obvious threat. But the image is disturbing. Why? It's done in soft pastel shades and seduces us into identifying with the subject. There is more. It's impossible to avoid projecting *human* qualities (the need to rest, relax, sleep) on this machine... and that is dangerous.

As the 21st century gets closer, and as genetic engineering and nanotechnology take shape, we find the boundaries between human beings and machines blurring, becoming eroded. But this is not a boundary which can so easily be transgressed. Beneath the slick surface of many futuristic images lies a tangled web of issues, concerns and fears.

One of the great hidden themes of the century is a collective suspicion that technical progress is deeply ambiguous; that, while we have benefited enormously from new tools and technologies, our sense of security has faded. Apart from fears created by large-scale global problems, we feel dwarfed by international organisations, out-paced by assembly-line robots, and out-smarted by computers. In a word, we feel de-humanised. It's for these and many other reasons, that the world of the future can look increasingly threatening.

The field of futures education tackles these issues head on. It should not be seen as just another subject fighting for recognition and funding in an already overcrowded curriculum. The futures field brings into schools, colleges and universities the means to participate more fully in the process of social and cultural change – to help instill the confidence that youth can act *now* for the future. Education itself may be inherently forward-looking but like many disciplines – economics is

a prime example – it fails to keep up with the times and loses its sense of direction. The future is *part* of the present, so any organisation that ignores it is taking unnecessary risks.

The Origins of Futures. In their own ways, our earliest ancestors were already dealing with futures. The makers of stone tools and the builders of ancient cities would have carried a clear image in their minds of the purposes which tools, buildings, walls and weapons would fulfil.

The modern futures field developed rapidly in military and commercial contexts, particularly in the cut and thrust of the Cold War, with its strike/counterstrike scenarios. Soon other organisations found that they required some means of scanning their environment, reading the trends and responding strategically. Before long a varied literature had developed and planners, analysts, futures researchers and environmental scanners could be found in most large organisations. However, those exposed to market forces and competition, those who needed to address a 'bottom line' and even risk going out of business became the organisations which took to futures more easily than the great public monopolies. As we near the end of the century there is a good deal of high quality futures work around, but it is not always accessible. Moreover, those in charge of educational systems tend, on the whole, to be unaware of the close links between futures and education.

A Rationale for Futures Education. Futures education rests on at least four central ideas. First, *rapid structural change tends to make many past assumptions, meanings and purposes redundant*. For example, we can no longer assume that the Earth is vast and inexhaustible. So the meanings of concepts such as growth, progress, health and defence change dramatically in a post-industrial world. The purposes which, to some extent, motivated earlier times (such as the conquest of nature, erecting national boundaries, defending exclusive cultures) are no longer appropriate or possible. Therefore, past experience becomes less reliable, less authoritative, because it relates to a world which, in many respects, is being left behind.

Second, *careful forward thinking – or foresight – is preferable to cri-*

Illustration by Ralph McQuarrie from the book *Robot Dreams* by Isaac Asimov. (Gollancz)



sis management. In a world which is physically and socially interconnected, many consequences are *displaced* in space and time. Acid rain, the mining of uranium, ozone depletion, terrorism and inappropriate educational goals are examples of a growing category of human activities that have their *origins* in one particular place at a particular time. Yet their *effects* turn up in many other places later. This fact makes it clear that foresight, futures thinking, and hence futures education have an important role to play in our 'brave new world'. Successful foresight permits a saving of the time, energy and money which would otherwise be expended clearing up the mess. It also means that we can respond to early signs that a system is under stress and change our behaviour before the system collapses. The foresight principle holds true in many different contexts: in fisheries, ecosystems, atmospheric pollution and the depletion of resources. In other words, foresight gives us some protection against the dangers of exponential growth in a finite world.

Third, *images of possible futures profoundly condition the present and affect what people consider to be worth doing.* Individuals have their own images which help to define their present role and future ambitions. Group images of future goals help to determine present strategies. Powerful groups use images to persuade others to buy products, consume particular resources or services and give support to projects. Such images are continuously negotiated at all levels of society, though often in implicit, hidden, ways (for example, through fiction, advertising, architectural panoramas and glossy project brochures). By focussing on these images and the way they function, we can gain new insights into social and cultural change. Moreover, we can use imaging as part of a deliberate process to move us toward the kind of future we want.

Finally, and this is the key, *most young people are already interested in the future.* They do not need to be forced to consider it because they are naturally interested in the unfolding of their own lives. Many have fears about such threats as violence, unemployment, pollution, wildlife extinctions and nuclear war. It is responsible to help students channel the energies which support these fears into strategies which address the source of the fear. This is 'the empowerment principle'.

So, while educational institutions have strong roots in the past, they cannot simply try to reproduce the past. They require credible future alternatives in order to make sense of the present and to establish appropriate strategies and directions. Leaders in any field have a long-term vision of the future. But most politicians lack such a vision and are merely administrators. For their part, educators tend to be too inward-looking and preoccupied with running the present system on a day-to-day basis. Both groups may be 'minding the shop', but few are 'scanning the horizon'. The lack of long-term vision translates into a lack of direction and purpose in the present. This is irresponsible, given the dangers – and opportunities – facing us.

Futures in Schools.

It is fairly common for general studies, careers, religious education, Australian studies, languages, drama and design (to mention only a few areas) to include an explicit futures component. Elective courses in futures studies will become more common as suitable course materials and trained personnel become more widely available. The first courses were taught in the 1960s. Today, on a global scale, there are thousands of teachers, lecturers and researchers

working in futures education. They are supported by a rich literature (see below) and organisations like the World Future Society (WFS) and the World Futures Studies Federation (WFSF).

Australia is unusual in that it had a two-year government-funded curriculum project initiated by the Bicentennial Authority and the Commission for the Future from 1986 to 1988. It was called The Bicentennial Futures Education Project (or BFEP). A range of curriculum materials was produced and distributed to 12 "lighthouse schools" in different states. A number of in-service functions were held and the schools clearly thrived on the opportunity to develop new curriculum offerings on futures. The project culminated with a conference in Adelaide.

The project clearly raised considerable interest, put futures studies on the educational agenda and produced a range of teaching strategies and materials. Yet only one of a range of planned publications was actually published. Evaluation was weak and long-term support was not secured. Four years later, the *latent* demand for futures work in schools remains high. But much of the momentum of this particular project has lapsed. Clearly, long-term curriculum development requires more durable support.

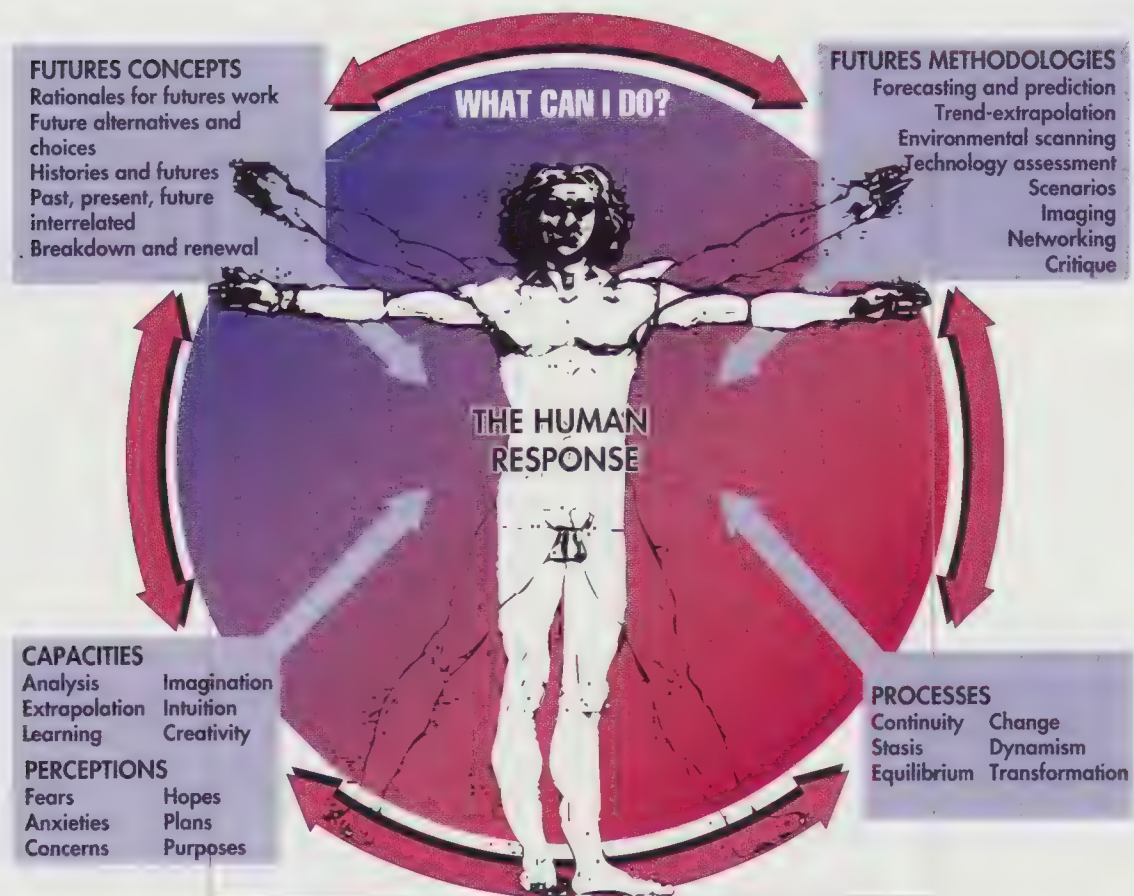
The Underlying Purpose of Futures Education.

Futures education is still being developed, so hard and fast rules should be avoided. However, three suggestions seem to emerge. In the first place, futures education seems to be about *providing the means to think ahead.* This involves valuing the human capacities which enable us to move out of the here-and-now, using futures concepts and applying futures methodologies. Second, *futures education seeks to provide facilitating contexts.* That is, places where people can safely hone their futures-imaging, futures-shaping skills. From these contexts spring the frameworks of support which unite people from different cultures in their search for a new world order. Third, futures education appears to be about *the re-negotiation of certain fundamental meanings and assumptions.* For example, the earlier meanings of terms like: growth, wealth, health, defence and sustainability tend to have decayed and need to be continuously reinvented. This is the particular focus of *critical* futures study.

In this context, 'critical' does not mean 'to criticise'. It means 'looking more deeply'. The sources of many long-term solutions and social innovations lie at these deeper levels: in the changing frameworks of value and meaning at the heart of the Western world-view.

Two Educational Projects.

Futures education occurs in schools, colleges and universities, but it is not limited to them. For example, the 'Prep 21' Project (initially the idea of Michael Marien, editor of *Future Survey*), could develop into an international network. The overall aims of Prep 21 are to "assist... in the identification of model courses and programmes; develop teaching aids; seek effective strategies for establishing courses... conduct futures workshops... publish select futures course syllabi; hold regional, national and international conferences; and develop a knowledge base of futures studies". In the past, many innovations in teaching futures have occurred in isolation. But this isolation may be coming to an end.



A second project, and one of the most successful undertaken by the WFSF, was the annual futures course at the International University in Dubrovnik. About 30 or so young people attended each year, along with several facilitators. The intention was to provide "something in between a graduate level university course and an academic seminar".

The courses were clearly successful, so the decision of UNESCO to help support a new Asia/Pacific futures course in Bangkok was welcome. The first such course was held in August 1992 on the theme of 'the futures of development'. Nearly 30 participants from 13 nations took part.

The Latent Demand for Futures Education.

The fact that futures is a new and non-traditional area means that people are unfamiliar with it and do not know what it offers. The demand for futures education is considerably less than it would be if it were more widely understood and supported. The responses of students to courses and the reactions of audiences to presentations make this clear. A frequent response is 'Why didn't someone introduce this before?'. One answer is that people simply hadn't thought about it. But this is changing. With over 25 years' experience in hand, futures education may be new in some places, but no-one could claim that it was untested.

Many comment on early difficulties, followed by deepening insight. So in order to activate the latent demand, futures work needs to be of the highest standard, and promoted much more effectively. Specific strategies are needed in each learning environment to help individuals over the threshold difficulties. If these conditions are met, futures education will develop and grow much more rapidly than in the past.

Conclusion.

It is important to see futures study and research as an essential component of educational theory and practice at all levels. Futures educators are, on the whole, well-placed to explore the implications of foresight as a human capacity and find ways to apply it in educational organisations. Fine examples of such explorations are individuals such as Austrian futurist Robert Jungk (profiled in issue 6 of 21•C) who made use of the university campus as a stage upon which to explore the way students visualised and perceived the future. Futures education itself is pre-eminently equipped to consider the transition from late industrialism toward a different form of society and culture. No-one can predict all the details of this process, or the events within it. But a careful study of continuity and change can provide us with a broad, *structural* overview of the coming decades. This evolving picture can be continually updated using futures methods.

In the past, innovations in futures education have been too dependent upon the politics of education systems, and the latter are always vulnerable to political changes and budgetary cuts. So a framework of support has long been needed to nurture and protect these innovations. The good news is that in late 1992 – early 1993 there are signs that such a framework is emerging from the work of organisations such as the WFSF, the WFS and now UNESCO.

As futures concepts, ideas and methods permeate educational systems, the latter will discover a renewed sense of vision and purpose. The language of futures will become commonplace and the 21st century will seem much more approachable. The varied imagery associated with futures will be less readily dismissed; it will be seen as a rich and suggestive resource which leads on to a fascinating and varied set of questions.

We may not have long to wait before an exam paper reads: "consider this image of a robot and give a critique of underlying assumptions"; or "explain the role of futures thinking in politics or education"; or even "give an account of how Australia made the decision to pursue sustainability in the 1990s".

Students who can answer such questions will not only understand the differences between people and machines, they will be actively involved in building the Australia of the 21st century. That sense of active involvement, of empowerment and vision, is a key outcome of futures education. ●

Futures Courses in Australia.

Deakin University, Rusden Campus. **Futures in Education**. B. Ed./Dip. Ed. Teachers in pre-service courses. Semester 2. (03) 542 7368. Noel Gough.

University of Melbourne, Institute of Education. **Education for the 21st Century, Education, Foresight and Cultural Change**. M. Ed. year 5 and 6. Semester 1 and 2. (03) 344 8662. Dr Rick Slaughter.

University of Newcastle, Department of Education. **Application of Futures Studies in Education; Futures Policy and Planning in Australian Education**. Post-graduate. Educators, ed. administrators and researchers. Semester 1 and 2. (049) 215945. Dr Allyson Holbrook.

University of New South Wales. **General Education Program**. A focus on futures is a requirement for all undergraduates throughout the university. All campuses: Kensington, St. George and College of Fine Arts. Semester 1 and 2. (02) 697 2434. Dr Denis Kenny, Director, Centre for Liberal and General Studies.

University of New South Wales. **Global Crisis: the Transition to a Sustainable Society**. Undergraduate General Studies, years 1 - 4. Semester 1 and 2. (02) 697 4745. Dr Ted Trainer.

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Godfathers to the lobe

Often perceived
as a mysterious
group of environ-
mental power players, the Club
of Rome have a foot in the door to
some of the world's most influential

THE CLUB OF ROME HAS HAD MORE THAN ITS fair share of infamy since its inception 25 years ago. Perceived by some as a shadowy billionaire boys' club set on shaping the future in their own vision, others see it as

rich industrialists finally taking on some share of responsibility for the planet's future. What triggered the hysteria surrounding this mysterious organisation was the publication in 1972 of the classic book of '70s futures studies and environmentalism, *The Limits to Growth*.

Appearing on the eve of the first United Nations environmental conference in Stockholm, this devastating study of humankind's long-term prospects was perceived by many as the ultimate doomsday book. Through a public relations campaign – on a scale never seen before for a scientific publication – it went on to become one of the most commercially successful science books ever printed, with over 10 million sales world-wide.

The Limits to Growth was so successful that it became a sort of Frankenstein's monster for the Club which could never match or fully cope with the publicity of its brainchild. Astonishing even to those within the Club, the *Limits*-phenomenon and the ensuing publicity they received, bordered on the miraculous.

The Club of Rome's members are spread across the globe; roughly two-third from Europe and the U.S. and one-third from the Third World. Many are members of such international organisations as UNESCO, UNEP and

figures. It's an offer the rich and well-connected can't refuse, says Peter Moll.

.....

the OECD. There are internationally renowned scientists (including a few Nobel laureates), former politicians, business leaders and administrators. Like most exclusive clubs – membership to the Club of Rome is limited to 100 – candidates are co-opted through personal contacts in the Club's executive council.

While members are often of diverging political persuasions, they are united by a concern for global problems such as the environmental crisis, population growth and the failure of development programs for a fairer balance of trade for the Third World. Australian membership includes former Governor General Sir Zelman Cowan, peace and UN activist Keith Suter, W.A. businessman John Stokes and academics Professor John Birch, Professor Alan Rodgers and Adolf Hanich.

The Club describes these issues and their interconnections as "the global problematique". Their goal is to stir up debate and present practical solutions to policy makers and power brokers; the wider public is conscripted only if necessary. As Club members obviously have their own high-powered positions to maintain, the majority of decision-making and implementation is done by members of the executive council. In effect, this group of 17



who meet two to four times a year makes up the 'real' Club. This high-flying and well-connected group includes Ibrahim Abdel Rahman, a former minister of planning and adviser to the prime minister of Egypt; Umberto Colombo, the director of the Alternative Energy Agency of Italy; Andre Danzin, the French president of the European Commission of Research and Development; Ricardo Diez-Hochleitner, the current president of the Club, a vice president of a large corporation and a former director of UNESCO and the World Bank; Adam Schaff, a Polish professor of philosophy and member of the Polish Academy of Sciences; Karan Singh, the Indian director of a development research institute and Alexander King, a Scottish senior scientist and civil servant and former scientific director of the OECD.

The Club was founded in 1968 by King and an Italian member of Fiat's board of directors, Aurelio Peccei. Peccei – whose extensive travelling in the Third World,

Rome. The meeting was a monumental flop. There was very little the luminaries could agree on and no resolution was reached on how to proceed. Only a small splinter group, meeting late on the last day, decided to go it alone.

Peccei began an intensive tour of the planet in search of others sharing his belief that urgent action had to be taken to tackle this "intangible web of problems".

As much as he attempted during 1968-70 to find people whose words would carry weight, there was relatively little that could be achieved without something in hand. Peccei stated bluntly: "no one was ready to invest appreciable fractions of his own present time, money or standing for the long-term good of mankind, or seemed convinced that such a sacrifice would be productive anyway. In short, our words carried no more weight than the Pope's homilies, the Secretary General's admonitions, or the warnings of concerned scholars and thinkers. They were forgotten almost before being heard."



As Club members obviously have their own high-powered positions to maintain, the majority of decision-making and implementation is done by members of the executive council.

China, and the Soviet Union allowed him to witness the predicament of people living in these regions – was the guiding spirit of the Club until his premature death in 1984. The understated organisational features of the Club complemented the personal qualities he used for his extraordinary contacts and commitment to the Club. Both Peccei and King shared a strong sense of urgency and concern about the "global problematique".

They firmly believed that the present route of 'progress' with ever larger production and use of material wealth and the ever increasing imbalance of opportunities between North and South (and between West and East) would have to be changed dramatically. To tackle these problems efficiently they initiated ways to involve people with ideas and influence.

The Club's name came about by dint of the first meeting's location. At the invitation of Peccei and King, 30 European luminaries of the sciences, administration and business worlds convened at the Academia dei Lincei in

Something tangible was required that would inspire action. It was in this spirit that *The Limits to Growth* was born – a publication which was just as much an instrument for political action as a scientific publication. A core group from the Club – Peccei, King, the Swiss economist Hugo Thiemann and the German engineer Eduard Pestel – committed themselves to this study as the starting point for their political activism. The remaining membership was barely informed or consulted. The project itself was carried out by scholars at the Massachusetts Institute of Technology (MIT), resulting in the final text by Donella Meadows, a professor of environmental studies at Dartmouth College.

Meanwhile Peccei was pushing the media, individuals within the OECD and UN agencies, politicians, public representatives, academics and powerful international business figures. Copies of the book were rushed to members of U.S. Congress and 400 members of UN agencies ahead of publication.

On March 2, 1972, a massive public presentation was launched at the Smithsonian Institute in Washington D.C. with the highest level UN administrators, politicians, diplomats and international scholars participating. Few grasped what was about to occur – including many of the Club's members, to whom the content was as astonishing as it was to the general public.

Most members refused to be identified with the notion of “zero growth” which was fiercely attacked by economists – a number of whom, ironically, were within the Club – and the Third World as unacceptable. At the following Club meeting in Paris a number of members demanded a public statement of denial against the most radical conclusions of the report. When Peccei refused, they immediately resigned.

As a face-saving measure the Club issued a statement clarifying their position. However the damage had been done. From that point the Club was labelled as the “Zero-

de Cuellar in the '80s. The Club has played a strong behind-the-scenes role in Warsaw Pact reform and maintained close contacts between the Polish Solidarity movement and the church. There were numerous meetings with General Jaruzelski and a Polish association for the Club of Rome was established which Jaruzelski hoped would be “a point of national reconciliation”.

Government leaders perceive the Club as an independent group of global citizens who can be used as mediators. The Club's impact is difficult to judge – meetings are informal and private conversations without protocol or formality – leading to its reputation as a shadowy behind-the-scenes organisation. The only public appearances of Peccei, King and the later secretary general of the Club, Bertrand Schneider have been in such countries as Poland and the former Soviet Union.

There are those who argue that the Club should come down from its lofty position and place more attention on

There are those who argue that the Club should come down from its lofty position and place more attention on specific planning and developments opening new opportunities for the world's future.



Growth-Club” and, throughout the '70s and '80s, would never fully rid themselves of the tag. It would take 20 years for the situation to change.

By the time of the UNCED Conference in Rio de Janeiro in 1992 the release of an update of *The Limits to Growth* received relatively little negative reaction. Awareness of environmental effects and problems had finally caught up with the Club. Now, few people openly disregard the environment as one of the most important factors shaping our future. *Limits* is no longer provocative.

After the massive publicity of *Limits* the Club turned to two key issues: the plight of the South in the international economy and its seemingly never-ending poverty, and the East-West relations which in the '70s and '80s were still the dominating force in world development. The private diplomacy of the Club began to work with far greater force. It was possible to make personal contact with U.S. president Jimmy Carter in the late '70s or U.S.S.R. president Mikhail Gorbachev and UN secretary general Perez

specific planning and developments opening new opportunities for the world's future. Its position concerning nuclear energy – expressed in the 22nd of the ‘Reports to the Club of Rome’ series, *The First Global Revolution* – takes little notice of better alternatives. In these and other respects, the Club is a truly establishment organisation.

The Club is adhering to the principle upon which it was founded: private diplomacy through personal contacts and membership of a very small elite. The overwhelming success and publicity of *Limits* were unexpected, one of those rare reports that came at the right time and with the right audience participation. It will not be repeated. However The Club of Rome will remain as long as there is a core elite with continuing interests in carrying on private diplomacy behind the locked doors of the rich and powerful. ●

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CONTINUED FROM PAGE 84 participating in 'post-compulsory' education. The areas of competency are language and communication; mathematics, scientific and technological understanding; cultural understanding; problem solving; and personal and interpersonal skills.

Early this year the Mayer Committee, charged with giving advice on developing competencies, recommended students broaden their learning through collecting, analysing and organising information; communicating ideas; planning activities; working in teams; using mathematical techniques; solving problems and using technology.

Mr Laurie Carmichael, a former assistant secretary of the ACTU, now chairperson of the National Board for Employment, Education and Training's employment and skills formation council, has been instrumental in tying in future training for young people with the nation's economic agenda.

Given the disparate reactions to these proposals, the litany of Finn, Mayer and Carmichael may dominate Australia's education debate into the 21st century. But the competencies argument is facing powerful opposition from universities fearing their autonomy will be threatened by calls for specific vocational training. And what of the future of arts, humanities and a liberal education?

Professor Penington was one of the first to fire a salvo. "If it's a question of a tightly controlled structure of unions, government and industry setting down in certificate form what is required in graduates, it ties education to the performance of *currently* recognisable skills. But business is not just looking at people for immediate employment. While there is a need for specific training, trying to certify exactly what a person is required to show in the workplace is not an assessment of their universal knowledge. Even at senior school level, competency related to employment is only one aspect of learning. It would be damaging to have senior school students constrained by utilitarian needs."

Competency related to employment is only one aspect of learning. It would be damaging to have senior school students constrained by utilitarian needs.

Professor McGaw also posits the risk that under the competencies theory, "only the cognitive aspects of learning will be considered and the value dimension will be lost". A further warning came from Professor Fenton G. Sharpe, a member of the Finn Committee, who said any discussion about ethics had disappeared in subsequent debate. Addressing a Directions in Education conference in May, he said: "A skills crisis in Australia would be bad enough, but a values crisis would be devastating."

Professor Yerbury, the higher education nominee on the Mayer Report, countered with the claim that universities have played a reactive, mostly negative role in the competencies debate. While she applauds the growth of research centres, and cutting-edge skills development in universities today, she adds significant caveats about the future of the vocational push.

The first is the frustration felt by "the brightest young minds" who study hard only to find few career structures and an absence of jobs. Due to these disincentives, "the development of Australia into a

highly competent society will be undermined," she concludes.

Second, she warns that universities must respond positively to the professions, working with them to develop competency-based standards, rather than "merely playing a narrow, vocational 'servicing' role". Finally, Professor Yerbury makes a case for the value of a rounded education – co-existing with competencies. Higher education, she says, "transcends skills formation and training. Quality assessment in higher education cannot therefore be confined to the kinds of skills-based competency measures being contemplated at other levels of the education system. That is a part of it: it cannot be the whole. The universities... properly stress the continuing importance of the humanities and the social sciences as well as science and technology, commerce and professional studies in the development of labour force competence."

Echoing Professor Penington's remarks, she says: "There are real dangers in focusing higher (or other education) on to vocational goals defined so narrowly that we train students for yesterday's needs, not tomorrow's."

Future Challenges. From state to state, governments grapple with educational philosophies, and the pragmatic concerns of running schools and universities. Teacher training and funding sources are two of the more problematic areas of debate. The Round Table report is critical of the quality of teachers and teaching, claiming "the best graduates from our school system are not currently interested in teaching as a career". In a major shake-up of teacher training, the University of Melbourne announced it will halve its intake of student teachers, and recommended students take a course such as arts or science, with further study to become a teacher – the aim: to attract the best minds.

Federated Teachers Union of Victoria president Peter Lord defended teachers' performance, but said starting salaries in the profession were unattractive, deterring many good candidates. Planning for the future will always be hamstrung by changing governments setting new agendas in the education portfolio. The State's VCE is an illuminating case study of an educational experiment becoming politicised, with the Liberal party claiming former Premier Joan Kirner created it for ideological reasons, ostensibly to improve equality of opportunity. Professor Penington was another trenchant critic of the VCE, and recently the vice-chancellors of Victoria's seven universities called for a review of the VCE's school-based assessment procedures.

While most students get just one shot at years 11 and 12 – a fact critics of the constantly-changing VCE often repeat – most educators are united in the opinion that education is a lifelong process. With universities in particular struggling to make resources stretch, funding issues could dominate the political future of education. Many students associations have rejected student loans as a means of financing education. But Professor Penington makes the point that student contributions could lower drop-out rates.

With predictions that higher degree students will make up 20 per cent of the University of Melbourne's student enrolments in the next decade, the user-pays system will be increasingly discussed, together with improving the efficiency of existing resources through technology-based learning.

Some of the eggs may be broken in the ongoing argument, but hopefully the education system will no longer appear a stressful factory line and students will be the better for it. ●

CONTINUED FROM PAGE 44 realise those goals on the basis of his beliefs. Thus, as Dr Georgeff outlines it, HAL acted accordingly:

GOAL:

- Successful mission

BELIEFS:

- Locked-out human = Dead human
- Disconnected HAL = Failed mission
- Live Dave = Disconnected HAL

INTENTION

- Locked-out Dave

As Dr Georgeff points out, when HAL tried to lock Dave out of the spacecraft to kill him, it did not require HAL to have special psychological attitudes such as self-preservation or a sense of competition. HAL's goal was for a successful mission and the information upon which his actions were based were responsibly placed within the system by the system designer. As Georgeff notes "Once you give machines the power to reason about doing things, you give them an awful lot of power. Even the systems that we have today for doing practical reasoning would do the sort of thing that HAL did. It is not fantasising to see these things as real problems".

"Belief, desire and intention are clearly three ways in which a human acts and gets around in the world," says Georgeff. "In addition humans have these added elements above that, there's emotions and fear and love... whatever, some of which just drive the desire and are not additional. But it's clear that things like fear and some of the other emotions have an important role in determining how humans behave and clearly have some role in determining how effective they are in getting around and surviving.

"So clearly we'll have to eventually introduce the same sort of emotional states into computers as we see in humans on the basis that it has some environmental advantage, but at this stage people in AI have not got around to considering why you would do that. We certainly know why you would have beliefs, desires and intentions because we can produce algorithms that show that with these three mental attitudes we can build machines that are more rational and intelligent than without them. No one has yet put up a good argument for why one would want to have a computer that suddenly got fearful or aggressive."

To take Georgeff's sci-fi cinema analogy further one may recall the problems raised by just such additions into an artificial system in Ridley Scott's *Bladerunner*. The 'replicants', produced by genetic engineers, are stronger than, and at least as intelligent, as their creators. However they are so advanced that they have developed a major flaw: they have the capacity, over an extended period of time, to develop what are essentially human emotions and thus their own desire to survive overrides any control their makers once had. Indeed such an emotional capacity could lead to a number of unpredictable, and unwanted, responses in the machine, ranging from experiencing anger through to simple boredom.

Georgeff agrees: "Even just at this stage where you introduce beliefs, desires and intentions, the machine is then working away to achieve its desires based on its beliefs. Now unless you're very careful, in order to realise its goals it may work out a way to program its desires – which you've programmed it to achieve – but the means it chooses to bring about those desires may involve consequences which you may consider to be disastrous" – HAL again!

"Even just allowing machines to fulfil their own desires can be very problematic. If in addition you have machines which have some emotional state, I'm sure it would become even more difficult to control their behaviour."

Bladerunner raises the issue of an almost 'deep-south' racist attitude to AI, where an intelligent system is reduced to slave-like labour, despite its 'awareness'. It is a debate that has already arisen in philosophical circles, and one that Georgeff believes has yet to be tackled by the scientific community.

"From a practical point of view we seem to be so enormously far from being able to build machines that have anything like that level of intelligence that I don't think many people think very seriously about it, unless one dives into

"Bladerunner raises the issue of an almost racist attitude to AI where an intelligent system is reduced to slave-like labour despite its 'awareness'."

philosophy. It's really just HAL and *2001* again. We could probably build a machine within the next five or 10 years that does most of the things HAL did. There are certain capabilities involving vision in particular that would probably remain beyond the state of the art. But his rational thinking, the way he reasoned about things, would be quite possible even now.

"The problem of course is that few people would really ascribe to such a machine any real 'feeling' and so the fact that it was used in a slave-like way I can't imagine concerning people. Eventually if we managed to reach a stage where machines were indistinguishable from at least monkeys, or even humans, those questions must arise because then you have the question 'do those machines have a mind?' and that becomes very difficult."

The debate will obviously continue and AI systems will become as common in our lives as the VCR. When one considers the work being tackled at AAIL, it is obvious that if AI systems sit comfortably in industries ranging from NASA to Carlton and United Breweries there is a strong role for Georgeff and his cohorts to play in the reconsideration of what intelligence is and how it can be adapted. One can only hope that the 'logical' glitches of HAL do not find their way into the home microwave. ●

Dator

CONTINUED FROM PAGE 14 meeting (the first Dator attended) was in Kyoto, Japan in 1970. Then Bucharest in 1972, and the actual Founding Conference, where the WFSF was officially established as an international organisation according to French law (as it remains), was in Paris in 1973.

This internationalist outlook has been deliberately fostered in subsequent years. "By holding our World Conferences in different parts of the world," says Dator, "we mobilise and legitimate local future-oriented people, and the entire futures focus, thus strengthening local futures research, as well as broadening it, and the future work of all who are able to attend."

If pressed, Dator says that the real reason for his success in Hawaii is his students. "The students in the Alternative Futures Option have tended to 'infect' other students with the futures bug. Some of them are now captains of industry and leaders of government. But, in the process, 'futures studies' here has become a normal part of life."

Given his long association with the field Dator has noticed some intriguing patterns in his students over the years. "In the '60s the future seemed extremely bright to most of my students.

One thing that makes me interested in the future is that I know nothing, and care nothing, about my past. I have no 'culture'.

They were positive and upbeat. Then we went through the shocks of the '70s – Vietnam, the oil crises, economic restructuring and all the rest – and the future seemed horrible. Interest in futures studies clearly dropped off. Then came the '80s. Even though from my point of view the '80s were, objectively speaking, much worse than the '70s, and certainly far worse for the future, my students became very upbeat again.

"The absolutely worst time was at the end of the '70s when Ronald Reagan, beginning to run for the presidency, introduced the idea of 'winnable nuclear war'. A lot of my older students, who had either been Vietnam veterans or war protestors, dropped out. They couldn't take it. But at present, interest in the future is extremely high among my students, and in most parts of the world. The futures consulting business, *per se*, is very good now – until the Depression, when business, or at least American business, will do the worst possible thing: stop looking at the future at all."

Dator's views on culture and technology are somewhat challenging. "One thing that makes me interested in the future is that I know nothing, and care nothing, about my past. I have no 'culture'. I don't know my ethnicity. I have no idea where the name

'Dator' came from. I always ask people, and while I get some interesting suggestions, actually no one knows. And I don't really care.

"However, I know that most people of the world care very much – far too much – about their ethnic background, so I have alternated back and forth between being sympathetic with ethnic revival movements and being unsympathetic and worried about their dangerous side. With the rise of nationalism in Europe again, I'm beginning to feel even more unsympathetic to ethnic identity questions. This makes me question even those which are on the rise here in Hawaii, as in Australia and especially in New Zealand".

Some futures people suggest that the future is made primarily by people and that technologies are just a secondary consideration. Dator doesn't agree. He sees technology as a major cause of social change.

"I certainly don't believe for a minute that people are passive and have no role in envisaging and creating their preferred future. But there are many forces creating the future and the will of people is only one of them. 'Will' alone is never enough, and, more importantly, 'will' is influenced by people's experiences – what they are able to do, and not to do – and technology plays a major role in enabling them to have new experiences and/or in making it difficult or impossible to have older ones. That is why I look at technology as a major agent of social change: it conditions human ideas.

"Technology humanises and re-humanises us. Humans are never without technology. We have had different kinds at different periods and cultures, but I consider it silly to talk about 'technology on a human scale' or even 'appropriate technology' without recognising that past experiences shaped by past technologies have created our ideas of what 'a human scale' is, or what 'appropriate technology' is. New technologies change the human scale, and may, in retrospect (or more adequate foresight) be seen as 'appropriate' after all."

The theme was explored by two of Dator's ex-students who co-authored an article not long ago about 'the rights of robots'. Sohail Inayatullah and Phil McNally argued that given the development of 'rights' historically, on the one hand, and the probable development of artificial intelligence and automation on the other, that it is not unlikely that at some point in the not-too-distant future, robots will demand rights – and get them.

"That is a real possibility," says Dator. "I really believe that we are moving into a wholly artificial world, and that we might very well be the last, or near the last, generation of *homo sapiens* in the form it has been for perhaps a 100,000, certainly 50,000, years. Indeed, 'humanism' could soon join all the other 'isms' of sexism, racism, ageism, etc. as an illegal and immoral sentiment. We are creating our own intelligent successors, our own children if you will, and we had better begin expanding our understanding of love and life beyond ourselves or any other 'naturally' evolved flora and fauna on the globe, and beyond the globe itself." ●

Rick Slaughter lectures in futures studies at Melbourne University and is an associate of the Australian Commission for the Future. His last story for 21•C was on economics futurist Hazel Henderson.

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The Swiss watch for boys and girls

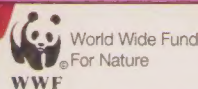
flik flak



It's time for fun and exciting FLIK FLAK watches. Today's boys and girls won't want to miss an expedition to the Animal Kingdom or an adventure on earth or in outer space.

Each of these FLIK FLAK watches come with a fantastic puzzle for girls and boys who like to stay right on track. Something to tinker with and dream about.

RSP \$34.95



Today the environment upon which we and all living things depend for survival, is being threatened by man. The Blue Whale, the African Elephant, and the Giant Panda are all endangered species. These three were selected for the WWF-FLIK FLAK watches in order to represent all nature that needs protection. With the sale of each of these watches FLIK FLAK will help support WWF by making a contribution of \$5.

RSP \$39.95

FLIK FLAK is waterproof tested to 30 meters, shock-proof and Swiss made with a 12 month guarantee.

flik flak

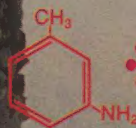
FLIK FLAK is available at leading Department Stores and Jewellers

What's Your Poison?

When you smoke you inhale up to 4000 chemicals including these poisons:

Hydrogen Cyanide
(Poison used in gas chambers)

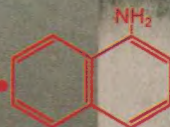
Acetone
(Paint Stripper)



***Toluidine**

Ammonia
(Floor Cleaner)

Naphthylamine*



***Urethane**

Methanol
(Rocket fuel)



Toluene
(Industrial solvent)

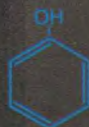
Pyrene*



Arsenic
(White Ant Poison)

***Dibenzacridine**

Dimethylnitrosamine



Phenol

Napthalene
(Mothballs)

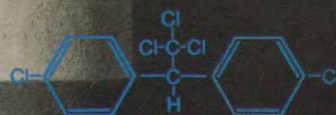


Butane
(lighter fuel)

Cadmium*
(used in car batteries)

***Polonium - 210**

Carbon Monoxide
(Poisonous gas in car exhausts)



DDT
(Insecticide)

Benzopyrene*



Vinyl Chloride*

It's enough to
make you sick.
Very sick.

Quit

*** Known cancer causing substances**

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